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14. ABSTRACT The purpose of this study is to develop and use culturally appropriate and stage-tailored Chinese language breast cancer brochures to promote older Chinese-American women's intentions to obtain mammography. A three-year research plan is designed to pursue this purpose. In Year 1, the brochures were developed and refined based on previous findings of cultural and language barriers to breast cancer screening in Chinese women. In Year 2, two-hundred and fifty Chinese women aged 50 and older in the Washington, DC area completed a telephone interview regarding their previous screening experience, cultural views, and screening barriers. Participants were randomly assigned to either an intervention group with stage-tailored brochures or a control group with standard brochures. In Year 3, we mailed the appropriate set of materials to participants and conducted process and outcome evaluations of the intervention materials. In a no cost extension period at Year 4, we completed the follow-up assessment and conducted data analyses. Cultural and language barriers were associated the regular use of mammography. Participants increased their intentions to obtain a mammogram after the brochure intervention. The PI has strengthened her expertise in cancer prevention research throughout the course of this project and advanced her professional development by receiving new funding and applying for faculty promotion.					
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DOD Cancer Development Award Year two progress report

Research title: Impact of culture on breast cancer screening in Chinese-American women

I. Introduction

Breast cancer is the most common cancer for Chinese-American women and is the second leading cause of cancer death in this group.¹ Research has consistently shown that Chinese-American women have the lowest rate of mammography screening among minority and ethnic groups²⁻⁵ and that Chinese-American women are more likely to be diagnosed with greater tumor size.⁶⁻⁷ However, few studies have presented systematic understanding about how these barriers connect to screening and what type of intervention is effective in promoting screening within this population. To expand current limited knowledge about Chinese women and their intentions to get screening, the proposed study aims to investigate cultural and language barriers to breast cancer screening among Chinese women. We will also conduct a brochure intervention to promote breast cancer screening in this underserved population. The objectives of this study are threefold: 1) conduct a baseline interview with older Chinese women to identify cultural and language barriers to mammography screening; 2) develop culturally appropriate Chinese language educational materials targeted by stage of adoption; and 3) conduct a process evaluation of the potential impact of these tailored materials on screening intention in this under-studied population. These objectives have been met. In this report, we summarize the baseline and follow-up results in response to the two specific aims of this study.

II. Body

The following outlines the progress made in the last year toward meeting objectives specified for the study. The specific aims of the study are as follows:

1. Use quantitative research methods to describe factors related to older Chinese women's breast cancer screening behaviors.
2. Develop and test culturally and stage-tailored educational materials designed to improve screening use in this population.

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II.1 Task 6. Analyze data and conclude the project, Month 25-36.

II.1.a Analyze the baseline and process evaluation data according to specific aims.

We have reported baseline results in our previous annual report in response to Specific Aim I. Factors that accounted for older Chinese women's use of mammography are Eastern view of health and cancer care (especially a fatalist view about cancer and preferences to self care), English ability, worry about getting breast cancer, and presence of physician recommendation and health insurance. As described in the previous report, the analyses of this study was connected to a larger trial (PI: Dr. Wenchi Liang), part of that study also investigates the impact of culture on breast, cervical, and colon cancer screening. Dr. Liang is also a collaborator of this current project. The baseline data consisted of 507 women who were at age of 50 and older. After excluding women who reported that they obtained mammography because of health problems, the final study sample consisted of 466 women. We divided our outcome variable into two categories: regular mammography screeners and non-regular screeners. Regular screeners included women who had a mammogram in the past year and had a previous mammogram within two years prior to the most recent test. Women who had mammograms beyond this time frame or who never had the tests were considered non-regular screeners. We summarize the analytical results in the following section.

Results from baseline assessment. We used chi-square tests and t-tests to examine bivariate associations between outcome variable, predictors (i.e. culture and language), and covariates (i.e. demographic and medical access factors). We utilized logisitic regression for multivariate analysis. The data analyses were performed by the SAS 9.1 program. We have written up the baseline results into a manuscript entitled “Culture, Language Ability, and Breast Cancer Screening in older Chinese Women” and are revised for publication (see Appendix A). The major findings are described as below.

Sample characteristics. Of the 446 participants, 443 were foreign born. Only three women were born in the U.S, but they were raised up in a Chinese-speaking environment. Among the foreign-born women, 64% were born in China, 3% in Hong Kong, 29% in Taiwan, and 4% in other countries including Singapore and Vietnam. The mean age of the sample was 64.5 years, ranging from 50 to 89 (standard deviation, SD = 9 years). The majority of participants had a college degree or higher (68%), had health insurance (77%), and was married (73%). Thirty-seven percent were employed. Fifty-three percent of the participants were classified as regular screeners.

Bivariate associations. Women who reported to have had regular mammography were significantly more likely to be younger ($p < .0001$), highly educated ($p < .0001$), and employed ($p < .0001$) than those not having regular mammograms. Compared to those not having regular mammograms, women who had regular mammograms were also more likely to worry about getting breast cancer ($p < .0001$), perceive a higher risk of getting breast cancer ($p < .0009$), have health insurance ($p < .0001$), receive physician recommendation ($p < .0001$), and have higher English ability ($p < .0001$). They were less likely to perceive access barriers ($p < .0001$), receive encouragements from family and friends for mammography ($p = .0171$), and hold Chinese cultural views of health and illness ($p < .0001$).

Multivariate analysis. Results from logistic regression support our study hypotheses. Women who hold an Eastern view of care were less likely to be regularly screened (OR=0.96, 95% C.I. = 0.94~0.99), controlling for other covariates. That is, for every 1 point increase in the cultural scale, the odds of being regular screeners were 4% less than being non-regular screeners. Similarly, with each increase of the English ability scale, there was a 43% increase in regular use of mammography (OR=1.43, 95% C.I. = 1.10~1.86). We also analyzed the relationships between sub-cultural scales (fatalism and self-care) and screening outcome. The effects of fatalism and self-care sub-scales on regular mammography use were both significant (OR=0.98, 95% C.I. = 0.97~0.99), and OR=0.99, 95% C.I. = 0.98~0.99, respectively), after controlling for sociodemographics and other important factors to cancer screening practice.

Our baseline results indicate that Chinese American women had much lower rate of using mammography screening (53%) and this is consistent with other reports^{8,9} and a recent report of California Health Interview Survey.¹⁰ Our results suggest that this low rate of mammography use is associated with cultural and language factors independently of other covariates. Therefore, culturally sensitive and linguistically appropriate intervention programs are important to educate Chinese women about breast cancer and to increase their participation in screening mammography.

Results from follow-up assessment. For Specific Aim 2, we have designed culturally sensitive, linguistically appropriate, and stage-tailored brochures for this underserved minority population. Copies of these brochures have been sent along with previous annual reports. In the follow-up period, 64 out of the 507 women withdrew from this study. The drop-out reasons include loss of interest to participate ($n = 22$), being ill ($n = 3$), moved out of the area ($n = 16$), passed away ($n = 1$), telephone disconnected ($n = 4$), out of contact after 10 attempts ($n = 10$), too busy to participate ($n = 6$), and hearing and vision impairment ($n = 2$). However, there were no significant demographic differences between participants and drop-outs. The follow-up study sample ($n = 443$) were randomized into three study arms: 1) reading a single fact sheet as a control group, 2) reading culturally tailored brochures, and 3) reading culturally tailored brochures and receiving telephone counseling by a nurse

practitioner. This three-arm research design was led by Dr. Liang. Although our data analyses was connected with this large trial, our report of the follow-up analyses would focus on examining the efficacy of culturally tailored breast cancer brochures on increasing intention to use of mammography to control group as proposed in the DoD research study. That is, we summarize the results of comparing the first two arms in this report.

Process evaluation. In respect to the quality of the brochures, more than 85 percent of the participants either in the brochure or control group said that the content of these brochures are very or extremely good. The ratings on the color, font, and pictures of the culturally tailored brochure were higher than of the standard single fact sheet. About 89% of the women in the culturally tailored brochure group expressed that the length of the brochure were very good compared to 82% of the women in the control group. Many women reading the tailored brochure said that they would read the brochure again when they need breast cancer information (71%) and recommend the brochures to their relatives and friends (85%), compared to women reading the standard fact sheet in the control group (68% and 79%, respectively). More than 55% of women rating the educational material they read were very useful (57% for the brochure group and 60% for the control group).

Outcome evaluation. Since the randomization was successful and there were no key demographic differences between the intervention and control groups, we assessed the outcome of the brochure intervention by changes in percentages of intention to obtaining a mammogram before and after the intervention. Results from the McNemar test showed that older Chinese women in the brochure intervention group increased their intention to obtain a mammogram from 74% at baseline to 80% at follow-up, although the 6% increased rate was not statistically significant ($p = .09$). Likewise, the percent change of screening intention for women in the control group was not statistically significant (76% at baseline and 79.5% at follow up, $p = .42$). These results suggest that both culturally tailored brochures and standard fact sheet are positive to increasing women's intention to obtain mammogram, although the effect of these print materials is not salient as expected. This lack of effect may be partly due to a ceiling effect in that most participants in the study, regardless of group assignment, had strong intentions to undergo mammography at follow-up. The effect might be somewhat more effective if we only enroll women who do not adhere to mammography screening guideline without including regularly screened women in this study.

Furthermore, these data clearly suggest the need to go beyond the print medium for delivering information regarding the importance of early detection of breast cancer. Based on the data from this study supported by the DoD award, the PI was able to receive new grants to develop a culturally tailored breast cancer video and would test the video in a randomized controlled trial. We expect that the video may be more powerful in arousal of emotions and cognitive engagement and have greater effect in motivating Chinese women to adhere to recommended mammography screening guideline.

III. Key Research Accomplishments

- ❑ Completed follow-up assessment and cleaned up follow-up data ready for analyses.
- ❑ Kept the data in a confidential fashion without connecting any personal information such as name, address, and telephone.
- ❑ Analyzed the baseline and follow-up data in a larger sample to examine factors that accounted for utilization of mammography screening, and evaluate the efficacy of culturally tailored and stage-matched brochure intervention on promoting intention to obtain a mammogram versus a control group.
- ❑ Utilized the study results to successfully compete federal and foundational research grants.

IV. Reportable Outcomes

- The PI has presented results of preliminary evaluation of the culturally tailored video intervention designed for Chinese women in three major conferences: 1) the annual meeting of the American Society of Preventive Oncology held in Bethesda, Maryland in February, 2006, 2) the 10th Biennial Symposium on Minorities, the Medically Underserved and Cancer held by Intercultural Cancer Council in Washington DC in April, 2006, and 3) the Mission Conference of the Susan G. Komen Breast Cancer Foundation held in Washington, DC in June, 2006 (Abstracts were included in Appendix B). This work was supported by this DoD award.
- With the support from the DoD award, the PI has collaborated with other researchers to co-write several papers to disseminate research findings of this project and other related projects. One manuscript entitled “Influence of culture and cancer worry on colorectal cancer screening among older Chinese women” has been published by the Ethnicity and Disease in 2006 (see Appendix C). Another manuscript describing the development of the cultural scale measuring Chinese Americans’ views of health care will be published by Health Education and Behavior (see Appendix D). A manuscript entitled “Development and evaluation of a culturally tailored video: Changing breast cancer related behaviors in Chinese women” has been revised and re-submitted to the Health Education and Behavior (see Appendix E).
- Based on baseline data from this DoD research study, the PI was honored to receive three awards including the Komen Special Population grant, ACS Mentored Research Scholar Grant, and the NCI R03 grant. With the support from these funds, the PI is able to conduct a randomized controlled trial to scientifically examine efficacy of culturally-tailored video intervention on increasing adherence to mammography use among Chinese women verse versus a generic video and versus a standard fact sheet .

V. Conclusions

We have completed data collection of this study and started analyzing the baseline and follow-up data. The baseline results have been written up into manuscripts. A manuscript describing the development of the cultural scale has been accepted to publish in the Health Behavior and Education (see Appendix D). Other manuscripts have been submitted for publications and are under review. In summary, our baseline results show that Chinese women in the metro DC area had a much lower rate in utilization of mammography screening compared to other ethnic groups; only 53% of the women regularly obtained mammography. This is a far lag behind our national goal to have 70% regular screening toward year 2010. Our results have also revealed that Chinese women’s regular access to use mammography is related to their cultural views about cancer and care. For example, women who believe that cancer is a fatal disease are less motivated to regularly obtain mammography. Women with Eastern cultural views rely more on self-care and prefer not to visit doctors unless they are sick. Lack of proficient English ability is also detrimental to seeking information about cancer care and obtaining timely mammography screening provided in the U.S. Taking these barriers into consideration, we created a set of culturally tailored and stage-matched brochures in Chinese languages for Chinese-American women. The content of the brochures incorporated Chinese cultural values to educate Chinese older women about breast cancer and screening. Results from the follow-up assessment showed that the print materials were well received by Chinese women (see summarized results in the process evaluation section stated above). However, the effect of the culturally tailored and stage-matched brochures was not statistically greater than the standard fact sheet, although the former was more likely to increase participants’ intention to obtain a mammogram. Further analyses of the follow-up data will be conducted to investigate whether there are other factors, beside demographic or medical resources, influence the effect of the intervention results.

As stated above, the effect of the culturally tailored brochure might be greater if our study population targets women who do not comply with the National Cancer Institute's mammography screening guideline. Our preliminary evaluation of the culturally tailored video among Chinese women who have not had a mammogram in the past two years showed a greater effect in increasing intention to obtain a mammogram (from 37% at baseline to 88% at follow-up). The PI will conduct a randomized controlled trial to evaluate whether the effect of culturally tailored video outweigh that of generic video and usual care condition on increasing adherence to screening mammography and reducing cultural and language barriers in a broader Chinese population.

With the support of this DoD Career Development Award, the PI has not only strengthened her expertise in cancer control research in Asian American populations, but also advanced to her career development by being awarded four new research grants, co-authored eight manuscripts, and qualified for promotion from Research Instructor to Assistant Professor. All of these are valuable for the PI's continued professional development and aid her growth to become an independent cancer control scientist. The PI greatly appreciates the DoD Breast Cancer Research Program for granting this study to enhance the PI's career development in cancer prevention and control research for this medically underserved, minority Chinese-American population.

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Appendix A

Cultural Views, Language Ability and Regular Mammography Use in Chinese American Women

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INTRODUCTION

Asian Americans and Pacific Islanders (AAPIs) are one of the fastest growing and most culturally diverse minority groups in the U.S., and Chinese are the largest AAPI ethnic group (23.8%). However, AAPIs remain one of the most poorly understood minorities as a paucity of research has explained their cancer outcomes. While the use of mammography and Pap smears has increased over the past decade (Breen and Kessler, 1994), screening rates among AAPIs remain the lowest among all U.S. ethnic groups (CHIS). Chinese American women even had lower mammography use rate than their Asian counterparts, such as Japanese, Korean, Filipino, and Vietnamese (Tu, 1999, CHIS). Although use of mammography and Pap smears in Chinese American women aged 50 and older have been increased (Lee, 1996), few women had recent screening and even fewer received regular screening (Lee, 1996). Given the fact that most of older Chinese women are immigrants, Chinese women may face unique cultural and language barriers to utilizing health services like screening mammography, on top of any other known screening barriers such as health insurance, physician communication, and attitudes toward screening (Tang et al, 2000, Yu et al, 2001, Tu et al, 2003, Wang et al 2006).

Previous studies have noted that cultural values affect cancer communication and screening in Asian minorities. For example, Cambodian American women who believed in karma were less likely to have ever had a Pap smear than those who did not (Taylor, 1999). Filipino- and Korean-American women were less likely to receive a mammogram if they went to traditional healers and felt embarrassed talking about breast cancer or mammography (Maxwell, 1998a). Older Chinese women holding an eastern cultural view were less likely to adhere to colorectal cancer screening (Wang, 2006). Qualitative research has suggested that these values keep Chinese individuals from seeking Western medical care and create misconceptions of

illness and cancer (Ma, 1999; Yamashiro and Matsuoka, 1997; Hoeman, 1996; Vu, 1996; Mo, 1992). For instance, illness is a result of fate and cancer is a dormant disease that can be triggered by breathing polluted air or eating frozen, preserved, or raw food.

Chen (1996) proposed a theory about perceptions of disease prevention and health promotion among older Chinese Americans. It concluded that Chinese people tend to view health holistically, where the ultimate goal is to harmonize with nature. They “harmonize with the environment” by adjusting and balancing the “yin-yang” in food intake and exercising regularly outdoors. They “follow the bliss” to react to whatever happen in their lives, which means they passively but positively deal with their destiny. In addition, they “listen to heaven” to accept that life events are already destined to happen and bad things or illness are a form of punishment. Similarly, Liang (2004) found that older Chinese women emphasized self-care by keeping moderate exercise and eating a hot-cold balanced diet, and some held a fatalistic view of illness and cancer. These cultural beliefs and values are especially ingrained in older Chinese Americans (Mo, 1992).

For immigrants from non-English-speaking countries, language use is a key component of acculturation (O'Malley et al, 1999; Acevedo, 2000; Anderson et al, 1993). Previous studies have found that acculturation, as measured by language use, is associated with use of medical care (Chesney et al, 1982; Van der Stuyft et al, 1989; Wells et al, 1989), drinking and smoking patterns (Chen et al, 1999; Coonrod et al, 1999; Alaniz et al, 1999; Chen et al, 1999), and compliance with therapy (Pachter and Weller, 1993). Acculturation is also predictive of practice of breast self-examination (Peragallo et al, 2000), and receipt of a mammogram (O'Malley, 1999; Suarez and Pulley, 1995) and a Pap smear (Suarez, 1995; Solis et al, 1990). A few studies indicate that the ability to speak English and the degree of English fluency were significantly

related to recent mammography and Pap test use among Chinese women (Yu et al., 1998, Lee, 1996, Tu, 2003).

The literature has suggested that cultural views and language ability effect Chinese women's participation in cancer screening. However, scarce research has examined whether these dynamic cultural factors independently explain cancer screening outcomes when including other important covariates (i.e. use of medical care). The goal of this study was to expand the knowledge of cultural and acculturative impact on Chinese women's receipt of mammography by using comprehensive cultural measures and evaluating their associations after controlling for use of medical care, access factors, and psychosocial factors including cancer worry and perceived susceptibility. We hypothesized that Chinese women with a strong Chinese view of health and medicine or limited English ability were less likely to have regularly received mammography than those with a less Chinese cultural view of health or better English ability.

METHODS

This cross-sectional study was part of a larger randomized controlled trial to improve cancer screening use in Chinese American women. The study protocol was approved by the Institutional Review Board at Georgetown University. Data on cultural views and cancer screening were collected through telephone interviews of Chinese American women recruited from local Chinese communities.

Population, Setting, and Eligibility

The study population was Chinese American women residing in the metropolitan Washington D.C. area. Eligibility criteria included being 50 and older and ability to communicate in Mandarin, Cantonese, Taiwanese, or English. Women who were short-term visitors (i.e. those who planned to stay in the U.S. for less than a year) were excluded because a

long-term follow-up is planned to assess use of cancer screening at 15 months following educational interventions and visitors usually do not receive preventive health care in the U.S.

Recruitment and Data Collection

A convenience sample of participants was recruited from several community-based venues, including Chinese churches, senior centers, health fairs, celebration banquets of Chinese organizations, and Chinese print media. Typically, leaders of the organizations endorsed the project and introduced the research team to the congregation or group. The research team then presented a brief overview of the project, including timeline of assessments, receipt of cancer educational materials, and risks and benefits of participation. Women were encouraged to participate because their views about health and cancer and experiences in preventive care would help understand the needs for cancer control in Chinese American women. Interested women were asked to provide a written consent and leave their contact information. Other strategies supplementing the group recruitment method included announcements in church bulletins, invitational flyers or announcements distributed to community organization members, and advertisements posted in local Chinese newspapers and grocery stores. Those women who contacted the research team and expressed their interest in participating in this study were required to mail back a signed consent form. Women providing the written consent received a bottle of brand-name multi-vitamin supplement either on site or by mail as a token of appreciation for participation. Consenting women were then contacted for a 30-minute computer-assisted telephone interview (CATI) by trained Chinese American interviewers. Interviewers received a one-day training first to get familiar with the survey and CATI system, and their initial interviews were supervised by investigators until they could fluently perform the tasks and handle participants' questions well. Eight people conducted the interviews, including

four Mandarin-speaking graduate students, one research assistant fluent in Mandarin and Taiwanese, and three Cantonese-speaking independent contractors. All, except for one student, were females. The majority of the interviews were conducted in Mandarin. Women who did not speak Mandarin were interviewed in their preferred dialects, such as Cantonese and Taiwanese.

Measures

Outcome variables

Utilization of mammography was our primary outcome. Women's history of participation in screening mammography was measured by questions regarding whether they ever had each kind of screening test, the date of the most recent test, and the interval between the two most recent tests (Rakowski, 1993). The stages of screening mammography were categorized as regular or non-regular. Regular screeners included women who had a mammogram in the past year and had a previous mammogram within two years prior to the most recent test. Women who had mammograms beyond this time frame or who never had the tests were considered non-regular screeners. Women were also asked about whether they underwent each screening test for health reasons (i.e., due to symptoms) or for routine checkups. Women who had undergone the tests for diagnostic reasons were excluded from subsequent analyses.

Predictor variables

Cultural views of health and illness. Chinese cultural views were assessed by 30 items. These items were primarily derived from qualitative data of five focus groups consisting of 54 older Chinese American women who were asked about their views of health, illness, cancer, and cancer screening (Liang, 2004). In addition, Chen's theory of Chinese American elders' view of health and illness (1996) and existing measures, such as beliefs in the balance of "yin and yang" and fatalism (Lee, 1996; Lannin, 1998) were incorporated. Responses to each item were assessed

on a 5-point Likert scale, ranging from "strongly agree," "agree," "neutral," "disagree," to "strongly disagree." The overall 30-item sum score was standardized to a scale of 0 to 100, in which a higher value represented a more Chinese cultural view. Principal component factor analysis of these 30 items yielded 7 factors, namely, fatalism, self-care, hot-cold balance, use of herbs, Western medicine, medical checkup, and lifestyle (Table 1, Liang, unpublished data). Since the 9-item fatalism and 2-item self-care sub-scales were consistently and significantly associated with breast, cervical, and colorectal cancer screening, their associations with mammography use in the presence of other important controlling variables were also examined. The reliability of the 30-item, fatalism, and self-care scales were 0.80, 0.82, and 0.73, respectively.

Language ability. Women's English ability was assessed by four items asking about their ability to read, write, listen to, and speak in English (Anderson, 1993), with a 5-point Likert type response ranging from "not at all," "not good," "fair," "good," to "very good." The sum score of these four items were re-categorized to four categories based on distribution, with a higher value representing higher English ability.

Controlling variables

Worry. Worry about developing breast cancer was assessed by one question: "Overall, how worried are you that you might get breast cancer someday (1 = not worried, 2 = somewhat, 3 = worried, and 4 = very worried)?" (Schwartz, 1995) Based on the distribution of responses, this variable was re-categorized to "not worried at all" vs. "worried."

Perceived susceptibility. This was assessed by one question: "During last year, how often have you thought about your own chances of getting colorectal cancer (1 = not at all or rarely, 2 = sometimes, 3 = often, and 4 = a lot)?" (Schwartz, 1995) Based on the distribution of

responses, this variable was dichotomized into “not or rarely thinking about getting breast cancer” and “thinking about it (sometimes, often, or a lot)”.

Health insurance. This was assessed by one question: “Do you have any health insurance coverage (Yes vs. no)?”

Perceived access barriers. Women were asked whether there were concerns about transportation, time arrangement, language, and health care coverage when making decisions whether to seek health care. This access barrier variable was then categorized as “no” and “yes (having at least one of the concerns).”

Physician recommendation. This variable was assessed by one question: “In the past two years, did any doctor who you had visited recommend you to have breast cancer screening (Yes vs. no)?”

Family/friend encouragement. Women were asked whether their family, relatives, or friends ever encouraged them to get mammography (Yes vs. no).

Sociodemographics.

We assessed age (50 to 64 vs. 65 and older), educational level (up to high school vs. college or higher), employment status (yes vs. no), and annual income. Annual income was subsequently excluded from the analysis because the variable had greater than 30% missing values.

Analysis

Descriptive analyses were performed first using t-tests or chi-square tests to compare differences between women who had regular mammography and those having not in terms of sociodemographics, cultural views, language ability, and other controlling variables. Next, a series of logistic regression analyses were conducted to examine associations between cultural

views, language ability, and mammography use: First, the base model consisted of sociodemographic variables (Model I); in Model II, controlling variables were included; next, cultural views and language ability variables were added to the second models. As mentioned before, we used both the overall 30-item cultural scale (model III) and the fatalism and self-care subscales (Model IV) to test the effect of cultural views on mammography use.

RESULTS

Of the 626 women who expressed initial interest in participation, 558 (89.1 %) completed a written consent. Of the 558 consenting women, 51 (9%) did not complete the telephone interview because of lack of interest when contacted again (N=17), ineligibility (N=9), or they stated they were too busy for the interview (N=7), felt uncomfortable talking about cancer (N=11), or could not be contacted for an interview (N=7). Overall, 507 Chinese women constituted the final study sample. About 21% of participants were recruited from Chinese churches, 17 % from senior centers or senior assisted living buildings, 29 % from other Chinese community organizations (e.g., alumni associations, community service organizations, and book and dance clubs), 14 % from health fairs, and 19 % from media or referrals from friends who either participated in or supported this study. Thirty-nine interviews (7.7 %) were administered face-to-face in senior centers (n=29), church (n=2), Chinese schools (n=2) or participants' homes (n=3) because of difficulty in completing the interview over the phone or in reaching the participants by telephone. In addition, three participants completed the baseline survey and returned them by mail because they were too busy to set aside time for a telephone interview. A few interviews were conducted in languages other than Mandarin: Twenty-five were conducted in Cantonese, five in Taiwanese, and four in Fuzhou, and three in English.

After excluding women who had mammography due to breast health problems, a total of 466 (91.9% of 507) women constituted the final sample. All participants were foreign born except for three who were born in the U.S. and raised up in a Chinese-speaking environment. About 64% were born in China, 3% in Hong Kong, 29% in Taiwan, and 4% in other countries including Singapore and Vietnam. The mean age of the sample was 64.5 years (standard deviation, $SD = 9$ years; range: 50 to 89 years). The majority of participating women had a college degree or higher (68%), had health insurance (77%), and was married (73%). Thirty-seven percent were employed. About 53% of the participants regularly obtained mammograms.

Table 2 describes the differences between women having and not having regular mammography. Women who reported to have had regular mammography were significantly more likely to be younger, highly educated, and employed than those not having regular mammograms. Compared to those not having regular mammograms, women who had regular mammograms were also more likely to worry about getting breast cancer, perceive a higher risk of getting breast cancer, have health insurance, receive physician recommendation, and have higher English ability. They were less likely to perceive access barriers, receive encouragements from family and friends for mammography, and hold Chinese cultural views of health and illness.

Model I shows that, after controlling for other sociodemographics, the effect of age on mammography use became insignificant (Table 3). In Model II, education and employment status were still significantly associated with mammography use. All the controlling variables, except for perceived risk for breast cancer and perceived access barriers, remained significant associations with mammography use. After cultural views and language ability were included in the model, higher education and being employed no longer predicted regular mammography use.

On the other hand, cultural views and English ability significantly predicted Chinese women's regular use of mammography. With each increase of the English ability scale, there is a 40% increase in regular use of mammography. Similarly, with one point increase of the overall cultural sum score (a more Chinese cultural view), there is a 4% decreased likelihood for a Chinese women to have regular mammography. The effects of fatalism and self-care sub-scales on regular mammography use were both significant ($OR=0.98$, 95% C.I.= $0.97\sim0.99$), and $OR=0.99$, 95% C.I.= $0.98\sim0.99$, respectively), after controlling for sociodemographics and other important factors to cancer screening practice.

DISCUSSIONS

This is one of the first studies examined the associations between cultural views, language ability, and regular mammography use in Chinese American women using comprehensive measures and controlling for other important factors related to mammography use. Our results demonstrate that, in addition to known factors contributing to women's mammography screening behavior such as physician recommendation and health insurance, cultural views and language ability are important barriers for older Chinese American women to obtain regular mammograms.

As hypothesized, women who held a more Chinese/Eastern cultural view were less likely to adhere to mammography screening guidelines. Although having health insurance and physician recommendation are the two prominent predictors of regular mammography in our sample, the linear association between cultural views and mammography adherence cannot be overlooked. The predictive power of cultural views on mammography use is robust, remaining significant by using either the overall cultural scale or the fatalism and self-care sub-scales. These suggest that the degree of inclination to Chinese cultural views influences a Chinese

woman's mammography screening behavior, and a change in any aspects of the cultural view is likely to modify Chinese women's mammography behavior.

Our finding of the negative association between English ability and regular mammography use is similar to findings from the literature showing that language ability is associated with initiation of health services or screening (Yu et al., 1998, Lee, 1996, Tu, 2003). This association persists after controlling for physician recommendation and other known factors to mammography use. One possible explanation is that women who had no or limited English ability were not able to fully communicate with their physicians and understand the needs for regular screening, even though mammography was recommended by their physicians. Another reason may be that women with low English ability were not likely to obtain health-related information in their native language as frequent as those written in English, which is evidenced by our previous study that Chinese women identified very limited resources of Chinese language health educational information from local Chinese newspapers and television channels or displayed in hospitals or clinics (Liang, 2004).

The associations between education and employment and mammography use were cancelled out when cultural views and language ability were included in the model. In other words, the influence of education and employment on mammography use is mediated by cultural views and language ability. Chinese women who had a higher educational level or were employed were more likely to adhere to mammography screening, compared to those with a lower educational level or not employed, because they were likely to better communicate with health care professionals in English or readily obtain health related information in English. Similarly, they were less likely to hold certain cultural views that kept them from seeking regular mammography. These findings suggest that addressing cultural and language barriers to

mammography screening experienced by Chinese women, especially those with a lower socioeconomic status, is a promising strategy to reduce screening disparities between women in lower and higher socioeconomic status.

Several limitations of this study should be considered when interpreting the results. First, the 30-item cultural view scales were developed primarily from responses of Chinese American women aged 50 and older to questions regarding their perceptions about health and illness/cancer and their experiences in health care in the U.S. (Liang, 2004). It is possible that other aspects of cultural views held by Chinese Americans were not captured. Second, the generalizability of this study is limited by the use of a convenience sample drawn mainly from Chinese community organizations, churches, and senior centers. Although mass media were used to encourage participation, relatively small numbers of women participated through this channel. Therefore, women who did not attend any activities or programs held by Chinese organizations, such as restaurant workers or those speaking in other Chinese dialects, are likely to be underrepresented in our sample. Cultural patterns as well as their associations with cancer screening behaviors may be different if these people are included. In addition, measures of cancer screening behaviors are subject to self-report bias.

Despite of the limitations, this study shows that different aspects of cultural views and English ability have great potentials in influencing older Chinese American women's mammography screening behavior. These two aspects are relatively modifiable, compared to other known factors such as health insurance coverage and other access barriers. Cancer screening educational programs targeting Chinese women are likely to be successful if acknowledging women's cultural barriers and including messages that counter those cultural barriers. For instance, women with a sense of fatalism need to be empowered to take charge of

their breast and cervical health. Likewise, health care providers should be sensitive to possible cultural barriers of their Chinese patients, especially those who are older immigrants, and address their specific concerns that keep them from getting mammograms. With respect to the language barrier, Chinese language educational materials, such as brochures, videos, booklets, and displays need to be readily available in clinics, hospitals, libraries, and mass media to provide older Chinese women with limited English ability with accessible information. Future research is needed to examine whether addressing cultural barriers through language-appropriate education and/or counseling and developing and distributing Chinese language educational materials will improve Chinese women's cancer screening adherence in a large representative sample.

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Table 1 Description of the 30-item cultural view scale.

Category	Statement
Fatalism	
	If I am meant to get cancer, I will get it.
	If we get cancer, the best way to deal with it is to accept it, just like the old saying: "Listen to heaven and follow fate."
	Health or illness is a matter of fate. Some people are always healthy; others get sick very often.
	I cannot control my destiny.
	Avoiding cancer is a matter of personal luck.
	No matter what I do, if I am going to get cancer, I will get it.
	It is hard to prevent cancer.
	Getting Cancer is like being sentenced to death.
	It is best not to think about cancer. If we think about it too much, we probably will get cancer.
Self-care	
	As long as I can take good care of myself and keep myself healthy, I don't need to see a doctor.
	I don't visit doctors if I'm not feeling sick.
Use of herbs	
	Herbs are a better choice for preventing diseases than western medicine.
	Herbs are more effective in harmonizing a person's yin-yang than western medicine.
	Herbs are better remedy for illness than western medicine.
Lifestyle	
	Regularity in meals and daily schedules can make us healthy.
	Keeping my mind happy, doing my hobbies, and not competing with others can lead to better health.
	Regular outdoor walking is essential to achieve good health.
Medical examination	
	I will be embarrassed if a doctor or a nurse checks my private parts.
	A lot of medical tests are too intrusive and make me uncomfortable.
	Medical doctors usually do unnecessary tests.
Hot-cold balance	
	Certain food is not good for me because it will disturb the hot-cold balance in my body.
	Most diseases, excluding external wounds, are caused by the imbalance between hot and cold in a person's body.
	Eating "cold" food in summer and "hot" food in winter will help strengthen my body.
Western medicine	
	We should not take "western" medicine too often, because its chemical ingredients will hurt our bodies.
	Western medicine is good for killing germs rather than preventing diseases.
Miscellaneous	
	Eating food prepared by myself is a key to good health.
	I know my body better than any one else.
	Bodily constitution is different for every person; therefore, some kinds of people are more likely to get cancer than others do.
	Going to clinics or hospitals too often will cause me to catch diseases or having bad luck.
	Qi-Kung or Tai-Chi practice can help regulate the "chi" in the body, which can increase one's stamina and prevent diseases.

Table 2 Characteristics of participating Chinese American women aged 50 and older by mammography status (N=466).

Characteristics	Not having regular mammography N= 221 (47.4%)	Having regular mammography N= 245 (52.6%)	P values
Demographics			
Age			
50-64 y/o	45.5%	65.6%	<0.0001
≥ 65 y/o	54.5%	34.4%	
Education			
High school or less	44.9%	16.7%	<0.0001
College or above	55.1%	83.3%	
Employed (% yes)	22.5%	52.5%	<0.0001
Controlling variables			
Cancer worry (% ever)	28.2%	46.6%	<0.0001
Perceived susceptibility			
Low	54.3%	41.6%	0.0009
High	25.3%	41.6%	
Missing	20.4%	16.7%	
Health insurance (% yes)	62.9%	91.9%	< 0.0001
Perceived access barriers (% yes)	64.5%	46.2%	< 0.0001
MD recommendation (% yes)	34.7%	72.0%	< 0.0001
Family/friend encouragement (% yes)	31.0%	21.3%	0.0171
Predictor variables			
Language ability			
Low	40.0%	10.0%	<0.0001
Medium-low	33.5%	22.6%	
Medium-high	14.7%	31.2%	
High	11.8%	36.2%	
Cultural views			
Overall sum score (mean)	57.0	50.9	< 0.0001
Fatalism (mean)	46.6	36.7	< 0.0001
Self-care (mean)	54.0	35.5	< 0.0001

Table 3 Logistic regression models describing associations of cultural views with mammography adherence in Chinese women (N=466).

Variable	Model I	Model II	Model III	Model IV
	Demographics	Model I + controlling variables	Model II + predictor variables	Model II + predictor variables
Demographics				
Age (≥ 65 y/o vs. 50-64 y/o)	0.91 (0.57~1.43)	0.96 (0.57~1.63)	1.05 (0.61~1.79)	1.06 (0.61~1.82)
Education (College or above vs. High school or less)	2.92 (1.85~4.63)	2.12 (1.27~3.54)	1.14 (0.63~2.07)	1.05 (0.57~1.94)
Employed (Yes vs. No)	2.74 (1.71~4.39)	2.02 (1.17~3.48)	1.67 (0.95~2.95)	1.52 (0.85~2.70)
Controlling variables				
Cancer worry (Ever vs. never)		1.91 (1.18~3.08)	1.98 (1.21~3.22)	1.94 (1.19~3.18)
Perceived susceptibility				
Missing vs. high		0.80 (0.41~1.54)	0.83 (0.42~1.64)	0.83 (0.41~1.67)
Low vs. high		0.72 (0.43~1.20)	0.72 (0.43~1.20)	0.70 (0.42~1.18)
Health insurance (Yes vs. No)		3.82 (2.07~7.08)	3.28 (1.74~6.20)	3.12 (1.65~5.92)
Perceived access barriers (Yes vs. No)		0.75 (0.48~1.18)	0.82 (0.52~1.30)	0.84 (0.53~1.34)
MD recommendation (Yes vs. No)		3.20 (2.05~5.01)	2.92 (1.85~4.61)	2.80 (1.76~4.46)
Family/friend encouragement (Yes vs. No)		0.46 (0.28~0.76)	0.50 (0.30~0.84)	0.51 (0.30~0.86)
Predictor variables				
Language ability			1.43 (1.10~1.86)	1.44 (1.11~1.89)
Cultural views				
Overall sum score			0.96 (0.94~0.99)	
Fatalism				0.98 (0.97~0.99)
Self-care				0.99 (0.98~0.99)
C-statistic	0.706	0.816	0.827	0.834

Note. Language and cultural views are continuous scores. High language scores mean higher English ability. High scores on cultural views indicate a more eastern view of care; low scores reflect a more western view of care. For every 1 point increase in the cultural scale, the odds of being regular screeners were 4% less than being non-regular screeners.

Appendix B

ABSTRACTS

30th Annual Meeting • American Society of Preventive Oncology, Bethesda, Maryland • February 26–28, 2006

Following are the 17 highest scoring abstracts of those submitted for presentation at the 30th Annual ASPO Meeting to be held February 26–28, 2006 in Bethesda, MD

Physical Activity and Colon Cancer Risk in the California Teachers Study (CTS)

Mai P, Sullivan-Halley J, Bernstein L, and the California Teachers Study Investigators

Purpose: To examine the association between recreational physical activity and invasive colon adenocarcinoma among women enrolled in a prospective cohort study.

Methods: 120,147 CTS participants residing in California and ages 20–84 years with no prior history of colon cancer were included in the analyses. Three hundred nine-five were diagnosed with invasive colon cancer between 1996 and 2002. The relative risks associated with lifetime recreational physical activity were estimated using multivariable Cox proportional hazards regression models.

Results: Recreational physical activity was not associated with colon cancer risk in the cohort overall. However, physical activity reduced colon cancer risk among post-menopausal women who had never taken estrogen or combined hormone therapy. Women who reported an average lifetime moderate or strenuous recreational physical activity (from high school through age 54 years) of at least 4 hrs/wk/yr had 48% lower colon cancer risk (relative risk 0.52, 95% confidence interval 0.31–0.85) than women with a lifetime average of less than 0.5hr/wk/yr. Risk was not reduced among postmenopausal women with a history of hormone therapy use. We observed no effect modification by age, smoking status, level of folate intake, or body mass index.

Summary: These data suggest that lifetime recreational physical activity protects against colon cancer in post-menopausal women who have not taken hormone therapy. Hormone therapy users benefit from a lower colon cancer risk associated with hormone therapy use, but recreational physical activity does not appear to reduce risk further among these women.

Preliminary Evaluation of a Breast Cancer Educational Video for Chinese-American Women: A Community-Participatory Study

Wang JH, Liang W, Schwartz M, Lee M, Kreling B, Mandelblatt JS

Purpose: Chinese women have among the lowest breast cancer screening rates in the US. We developed and evaluated a culturally-tailored educational video guided by the Health Belief Model to promote Chinese women's use of mammography.

Method: This study included three phases: 1) focus-group discussions and an advisory board meeting including Chinese community leaders and cancer survivors to guide the video development, 2) producing the video with community actors, and 3) conducting a pre-post test pilot to evaluate the efficacy of the video in changing knowledge, beliefs, and screening intentions among Chinese women (age>39) who were not adherent to current NCI mammography guidelines ($n = 50$).

Results: A 17-minute video was produced in Mandarin and dubbed with Cantonese voices. The video included a soap-opera addressing barriers to screening and a segment with a physician recommending screening. Our preliminary evaluation of the video showed that compared to 37% at baseline, 88% of the participants intended to obtain a mammogram after viewing the video ($P < .0001$). There were significant increases in knowledge about breast cancer and mammography ($P = .001$) and decreases in Eastern cultural views of cancer ($P < .0001$). More than 84% of the women liked the video and said it was understandable, persuasive, and clear.

Conclusion: Our video was successfully created based on an intensive collaboration within our local Chinese community. This culturally-tailored video has the potential to motivate Chinese women to adhere to mammography screening. We will be testing the efficacy in future trials with broader community populations.

Variants in Estrogen Biosynthesis and Metabolism Genes and Urinary Estrogen Metabolites in Women with a Family History of Breast Cancer

Greenlee H, Chen Y, Kabat GC, Wang Q, Kibriya MG, Gurvich I, Sepkovic DW, Bradlow HL, Senie RT, Santella RM, Ahsan H

We conducted a pilot study to examine associations between polymorphisms in genes related to estrogen biosynthesis (CYP17 T→C, CYP19 TTTA repeats) and metabolism (CYP1B1 codon 432 G→C and codon 453 A→G, COMT codon 158 G→A) and urinary estrogen metabolites (2-hydroxyestrogens (2-OHE), 16-alpha-hydroxyestrone (16-alpha-OHE1), and their ratio) in 64 pre- and postmenopausal women with a family history of breast cancer. Women were participants in the Metropolitan New York Registry, one of six NCI Breast Cancer Family Registries. We used linear regression to examine the associations between genetic polymorphisms and log-transformed urinary metabolite levels. After adjusting for menstrual status, BMI and age, we found that carriers of the CYP1B1 codon 453 G allele had 31.0% lower levels of 2-OHE (P -values = 0.053) and 40.2% lower levels of 16-alpha-OHE1 ($P = 0.005$). When we restricted the analyses to premenopausal women ($n = 41$), we found similar results. Consistent with other studies, among premenopausal women the COMT codon 158 A allele was associated with increased 2-OHE levels ($P = 0.031$) and an increased 2-OHE/16-alpha-OHE1 ratio ($P = 0.035$); the CYP17 C allele was associated with increased 2-OHE levels ($P = 0.082$). To our knowledge this is the first report showing the effect of the CYP1B1 codon 453 G allele on urinary 2-OHE and 16-alpha-OHE1 metabolites, despite the small sample size. Further larger studies should be done to confirm these results.

A Cohort Study of Body Mass Index, Abnormal Glucose Metabolism and Mortality from Hematopoietic Cancer

Chiu BC-H, Gapstur SM, Greenland P, Wang R, Dyer A

Purpose: Using data from a prospective cohort study, we investigated associations of interviewer-measured body mass index (BMI) and postload plasma glucose (PLG) levels with risk of mortality from non-Hodgkin lymphoma (NHL) among persons without diabetes at baseline and to explore associations with leukemia and multiple myeloma.

Methods: Employees of 84 Chicago-area organizations, with an average age of 40 years at baseline, were screened from 1967 to 1973. Height and weight were measured by study nurses. A 50g oral glucose load was administered to nondiabetic participants. Of the at-risk cohort of 35,420 men and women, 129 died of NHL, 151 died of leukemia, and 66 died of multiple myeloma during an average of 31 years follow-up.

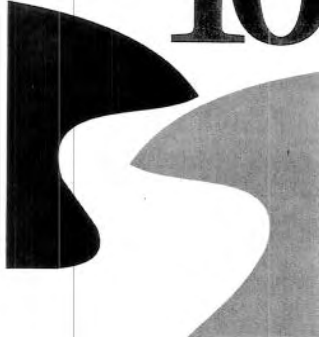
Results: Among men, there were positive dose-response relations of BMI with NHL (Hazard Ratio (HR) = 2.57, 95% confidence interval (CI) = 1.24–5.34 for the highest vs. lowest quartile, P -trend = 0.01) and leukemia (HR = 1.98; 1.07–3.69, P -trend = 0.02), after adjustment for age, education, smoking status, and race. PLG also was positively related to NHL (HR = 2.86, 1.35–6.06 for the highest vs. lowest category, P -trend = 0.004). For women, a higher BMI was positively associated with leukemia (HR = 2.47; 0.96–6.36; P -trend = 0.02) and the highest level of PLG was associated with a three-fold higher risk of mortality from multiple myeloma (HR = 3.06; 1.05–8.93). The risk estimates for obesity and PLG remained essentially unchanged after adjusting for each other.

Conclusion: Our data suggest that factors associated with BMI and/or abnormal PLG might play an important role in the mortality from NHL and possibly, leukemia, and from myeloma in women.



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#175

Racial/Ethnic Disparities In Definitive Treatment For Clinically Localized Prostate Cancer

Willie Underwood, Susan Eggly, Louis A Penner, Terrence L Albrecht

Prostate cancer accounts for 33% of all newly diagnosed cancers; further, there are projected to be 232,090 incident cases of and 30,350 deaths from prostate cancer in 2005. Compared to whites, African American men (AAM) are at greater risk for both developing and dying from this cancer. Although the higher mortality among AAM may be secondary to inherent genetic differences, disparities in the utilization of definitive therapy may also contribute to the observed disparity in mortality. Therefore, we sought to describe the use of definitive therapy for localized/regional prostate cancer among white, Hispanic and AAM.

Methods The sample included 142,340 men with localized/regional prostate cancer (81.6% white, 6.4% Hispanic, and 12.0% African American) identified in the national Surveillance, Epidemiology and End-Results registry (SEER) diagnosed between 1992-1999. Multivariate regression models were used to determine the odds of receiving definitive treatment by race/ethnicity adjusting for age, marital status, tumor grade, and SEER site. In order to determine the relationships between race/ethnicity and clinical determinants of treatment, we developed multiplicative models including interactions between race and age, grade and SEER site.

Results Overall, the odds of receiving definitive therapy for Hispanic and AAM diagnosed with moderately differentiated grade cancers were 0.84 and 0.64, respectively, compared to white men. Among men diagnosed with poorly differentiated grade cancers, the odds of Hispanic and AAM receiving definitive therapy were 0.77 and 0.49 respectively.

Conclusions Significant treatment disparities were noted in men with the higher grade cancers. Our finding of racial/ethnic disparities in definitive treatment varying by tumor grade provides an important link between racial/ethnic disparities in treatment, the racial/ethnic disparities in disease characteristics and racial/ethnic disparities in prostate cancer mortality.

#176

Evaluation of the impact of a culturally-tailored educational video on changes in breast cancer related behaviors in Chinese women

Judy Wang, Wenchi Liang, Marc D Schwartz, Marion M Lee, Barbara Kreling, Jeanne S Mandelblatt

Introduction. Chinese women have among the lowest breast cancer screening rates in the US. Few intervention programs have been designed to overcome their cultural and attitudinal barriers to screening mammography. This study was to develop and evaluate a culturally-tailored educational video guided by the Health Belief Model to promote Chinese women's use of mammography.

Method. This study included three phases: 1) focus-group discussions (n=36, age>39) and an advisory board meeting including Chinese community leaders and cancer survivors to guide the video development, 2) producing the video with Chinese community actors, and 3) conducting a pre-post test pilot to evaluate the efficacy of the video in changing knowledge, beliefs, and screening intentions among Chinese women (age>39) who were not adherent to current NCI mammography guidelines (n=50).

Results. A 17-minute video was produced in Mandarin and dubbed with Cantonese voices. The video included a soap-opera addressing barriers to screening and a segment with a physician recommending screening. Our preliminary evaluation of the video showed that compared to 37% at baseline, 88% of the participants intended to obtain a mammogram after viewing the video ($p<.0001$). There were significant increases in knowledge about breast cancer and mammography ($p = .001$) and decreases in Eastern cultural views of cancer ($p<.0001$). More than 84% of the women liked the video and said it was understandable, persuasive, and clear.

Appendix C

THE INFLUENCE OF CULTURE AND CANCER WORRY ON COLON CANCER SCREENING AMONG OLDER CHINESE-AMERICAN WOMEN

Objectives: This study investigated the hypothesis that adherence to colon cancer screening guidelines among Chinese women was associated with Eastern cultural views and anxiety about developing colon cancer.

Design: Cross-sectional data from a community-based longitudinal study were used to examine the hypothesis of this study. Measures of sociodemographics, medical access factors, cultural views of health care, cancer worry, and practices of colon cancer screening were administered by a computer assisted telephone interview.

Participants: Four hundred and thirty-three Chinese-American women from Metropolitan Washington, DC age 50 years and older and without a history of colon cancer completed the telephone interview.

Main Outcome Measure: Adherence to utilization of either fecal occult blood test (FOBT) within a year, sigmoidoscopy within five years, or colonoscopy within 10 years was used to define two outcome categories: current screeners and noncurrent screeners.

Results: Controlling for covariates, this study found that: 1) women with more Eastern cultural views were less likely to be current screeners; 2) women who thought about the chance of getting colon cancer had approximately three-fold greater odds of being current screeners than women who never thought about colon cancer; and 3) women receiving physician recommendation for colon cancer screening had more than three-fold increased odds of being current screeners than those who had not received a recommendation.

Conclusions: In addition to the lack of physician recommendation, older Chinese women face cultural and psychological barriers to obtaining timely colon cancer screening. These barriers may be reduced through culturally sensitive intervention studies. (*Ethn Dis.* 2006;16:404-411)

Key Words: Cancer Worry, Chinese-American Women, Colon Cancer Screening, Colonoscopy, Cultural Views of Health Care, FOBT, Physician Recommendation, Sigmoidoscopy

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INTRODUCTION

Colon cancer is the second most common cancer and the third leading cause of cancer-related death among the Chinese-American population. Chinese Americans have higher colon cancer death rates than non-Hispanic Whites¹ and are more likely to be diagnosed with late-stage colon cancer than Japanese and White women.² Despite this disease burden, little research has been done on Chinese-Americans' colon cancer screening practices.

In 2001, overall US self-reported colon cancer screening rates (including use of fecal occult blood test [FOBT], sigmoidoscopy, or colonoscopy) were 45%–48%.³ In contrast, only 22%–31% of Chinese women report ever having had FOBT and sigmoidoscopy, and among these women who ever had FOBT, just 38%–42% report an FOBT in the past year.^{4–5} These data are consistent with previous data that indicate that Chinese women also underutilize breast and cervical cancer screening.^{6–9}

Lower rates of cancer screening in Chinese women may be the result of several unique cultural and psychosocial barriers, beyond commonly recognized

Many older Chinese women believe that thoughts about cancer may eventually cause cancer.^{19,21}

barriers such as lack of healthcare resources and physician recommendation.^{4,8–16} For example, traditional Chinese medicine emphasizes natural approaches to the treatment of disease (eg, herbal medicines and balanced food).^{17–19} Furthermore, in Chinese and other Asian cultures, cancer is viewed as an unpreventable and fatal disease.^{10,20} Many older Chinese women believe that thoughts about cancer may eventually cause cancer.^{19,21} Additionally, Chinese women generally perceive themselves to be at lower risk of developing cancers compared to Caucasian women.^{12,19} Given such beliefs, we believe that Chinese-American women who hold Eastern cultural views may be disinclined to obtain colon cancer screening.

This community-based study was designed to evaluate cross-sectional associations between Chinese-American women's cultural views of care, level of worry about the risk of cancer (cancer worry), and use of colon cancer screening tests. We hypothesized that women with more Western cultural views would be more likely to report adherence to colon cancer screening than women with more Eastern views after considering other factors. In addition, based on reports that correlate cancer worry with likelihood of breast cancer

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screening,²²⁻²⁴ we hypothesized that colon cancer worry would be associated with screening adherence.

METHODS

Setting and Recruitment

This report is part of a larger study approved by the Georgetown University Institutional Review Board to investigate the effect of cultural beliefs on cancer screening in Chinese-American women. Chinese women were recruited from the Washington, DC metropolitan area (the District of Columbia, Fairfax County in Virginia, and Montgomery and Prince George's Counties in Maryland).

With support from local Chinese community leaders, the researchers attended health fairs, Chinese New Year Celebrations, and various community events at Chinese cultural service centers, senior centers, churches, and Chinese and Taiwanese associations to introduce this study and to distribute Chinese-language recruitment flyers. Recruitment notices were also posted in Chinese newspapers and Chinese associations' newsletters and web sites. After these public announcements, women were approached to evaluate eligibility and interest in participation. Women who were not US residents and/or were younger than 50 years of age (exclusion criterion from parent study) were excluded from the project. Eligible women were invited to participate and again were told about the purpose, procedures, benefits, and risks of participating in the study. Participants were offered incentives such as a bottle of multivitamin supplement after enrolling and periodic health-related newsletters after completing the interviews.

Overall, 573 eligible Chinese women expressed interest in participation. Of these, 509 (89%) consented to participate. Of the 509 consenting women, 438 (86%) completed the interview, 6% declined the interview,

and 8% were pending contact at the time of the present analyses. Of the 438 women who completed the interview, five reported a personal history of colon cancer and were eliminated from analyses. Thus, the final sample for this report was 433 women.

Data Collection

A structured telephone interview was used to collect information regarding practices of FOBT, sigmoidoscopy, and colonoscopy; cultural views about health care and Western medicine; presence of physician recommendation; worry about getting colon cancer; and sociodemographics. All survey questions were translated into written languages commonly used in China, Hong Kong, and Taiwan. Bilingual speakers (English and Chinese) translated the survey questions, and back-translation was conducted to assure accuracy. Trained interviewers speaking Mandarin, Taiwanese, or Cantonese conducted computer-assisted telephone interviews with consenting women. Three participants chose to complete the interview in English. Eighteen participants who had difficulty in answering questions by telephone were interviewed in person. On average, the interviews lasted one hour.

Measures

Outcome Variable

Utilization of colon cancer screening was our primary outcome. According to clinical guidelines endorsed by the American Cancer Society, asymptomatic and average-risk adults aged 50 and older should receive either an annual FOBT, a sigmoidoscopy every five years, or a colonoscopy every 10 years.²⁵ We measured Chinese women's adherence to these guidelines with a series of questions. First, participants responded to separate questions about whether they had ever had FOBT, sigmoidoscopy, or colonoscopy. Women who reported having ever had a particular test

were queried about when they had their most recent test. For FOBT, choices of screening intervals ranged from within one year, one to two years, more than two years. The intervals for sigmoidoscopy were from within one year, less than or about five years, and beyond five years. The timing of the most recent colonoscopy was either within or more than 10 years. Alternatively, women could respond to the choice—don't know or unsure—if they did not remember when they went for the test.

Based on answers to these questions, colon cancer screening outcomes were divided into two levels: current and noncurrent. Current screeners were defined as having either FOBT within a year, sigmoidoscopy within five years, or colonoscopy within 10 years. Noncurrent screeners were women who either had not had any of the three tests within the recommended screening interval or had never been screened for colon cancer.

Predictor Variables

Cultural Views of Health Care. Based on previous focus group data from Chinese-American women,²¹ we developed a scale to measure Chinese women's cultural views about cancer and health care. The scale consisted of 30 items designed to measure the use of herbs, values of Western medicine, fatalistic views of cancer, lifestyles, modesty, feelings about Western medical examinations, other cultural ways of care (eg, practices of Qi-Kung or Tai-Chi), and traditional beliefs in hot-cold balance. For each item, women responded by using a five-point Likert scale from strongly agree to strongly disagree. The inter-item reliability was .80.

Cancer Worry. We assessed cancer worry with two items from previous research.²⁶ Explicit worry was measured with the item: "Overall, how worried are you that you might get colon cancer someday? 1 = not worried, 2 = some-

what, 3 = worried, and 4 = very worried. Thoughts about cancer were assessed by the item: "During last year, how often have you thought about your own chances of getting colon cancer? 1 = not at all or rarely, 2 = sometimes, 3 = often, and 4 = a lot."

Based on the distribution of responses, each of these variables was dichotomized: not worried vs any worry (somewhat, worried, and very worried), and not thinking about getting colon cancer vs thinking about it (sometimes, often, and a lot). "Worry" and "thoughts" were each analyzed separately to examine their unique effect on screening.

Covariates

Sociodemographics. We assessed age (50–64 vs ≥ 65), educational level (\leq high school vs $>$ high school), marital (currently married vs not married) and employment status (yes vs no), and annual income. Annual income was subsequently excluded from the analysis because the variable had $>30\%$ missing values.

Medical Access Factors. We also assessed medical access factors such as having health insurance (do you have any health insurance coverage? Yes/No), presence of a regular physician (do you have a doctor or nurse you usually see when you are sick or want a checkup? Yes/No), and physician recommendation (in the past two years, did any doctor recommend that you have colon cancer screening? Yes/No).

Symptoms. We sought to distinguish between colon cancer tests that were for the purpose of screening vs those that were diagnostic; thus, all participants were asked the following question: "Did you go for your last FOBT (or sigmoidoscopy, or colonoscopy) because of health reasons or as part of a routine checkup?" Of the 433 women, about 57% reported that they received screening as part of a routine check-up. These

women were classified as asymptomatic; the 19% ($n=82$) who reported that they underwent one or more of these tests for health reasons were classified as symptomatic. Among women who had never had colon cancer screening ($n=106$), we asked: "Have you ever heard about these tests?" If the answer was "yes," we asked why they had not received the tests. Those who reported not having had these tests because they were healthy and had no physical symptoms were also classified as asymptomatic ($n=55$). To be conservative, the remainder of these participants ($n=51$) were classified as symptomatic. Thus, overall we classified 300 women (69%) as asymptomatic and 133 (31%) as symptomatic.

Data Analysis

We conducted bivariate and multivariate analyses to test the two study hypotheses. Missing data from the cultural scale were imputed with a mean substitution. Scores on each cultural item were summed to yield an overall Chinese cultural view score. We normalized the cultural sum scores from 0–100 points for the convenience of interpretation. Missing binary variables were imputed by placing missing cases in the category when its odds of predicting a criterion are closer to 1. That is, the missing variable was placed in the category that would decrease the association between the imputed variable and the outcome variable to avoid an artifact of overestimating the association.

To examine bivariate associations between screening and predictors, we used chi-square tests for dichotomous variables and t tests for continuous variables. Multivariate modeling of the effects of cultural views and cancer worry on colon cancer screening was conducted by using logistic regression with hierarchical variable entry. Variables with statistically significant associations with screening outcomes were included in the multivariate model. In the logistic models, we employed a hier-

archical variable entry approach in which we retained the significant predictors (P value $<.05$) from each tested model and added the next set of predictors to the subsequent models. In model 1, we entered demographic variables including education and employment status. In model 2, we retained significant variables from model 1 and then entered medical access factors (health insurance, presence of a regular doctor, and physician recommendation for colon cancer screening). Model 3 included all significant variables from model 2 plus the symptom variable. Based on its clinical relevance, we controlled for the symptom variable in all models regardless of its significance. In the fourth model, we retained significant variables and the symptom variable from model 3 and added colon cancer worry and thoughts about colon cancer. To examine whether cultural views about health care explain variance in colon cancer screening outcomes after adjustment for covariates examined in model 4, the variable of culture was the last predictor entered in the final model. Odd ratios (OR) with 95% confidence intervals (CI) were used to estimate the significance of the odds of current screening vs noncurrent screening for each study variable. The assessment of significance of blocks of variables entered in each step was based on estimation of differences in the likelihood ratio chi-square and degree of freedom (df) between two evaluated models. The SAS 9.0 version statistical program (SAS Institute Inc., Cary, NC, USA) was used to perform all analyses.

RESULTS

Sample Characteristics

Of the 433 participants, 432 were foreign-born. Among the foreign-born women, 60% were born in China, 3% in Hong Kong, 31% in Taiwan, and 6% in other countries including Singapore and Vietnam. The mean age of the

Table 1. Bivariate associations between sociodemographics, medical care resources, cancer worry, and cultural variables with screening outcomes (N=433)

Variables	Whole Group	Current Screeners (n=246)		Noncurrent Screeners (n=187)		P values
	No.	No.	%	No.	%	
Age						.9625
50 to 64 years old	246	140	57	106	57	
≥65	187	106	43	81	43	
Education						<.0001
≤High school	127	51	21	76	41	
>High school	306	195	79	111	59	
Marital status						.1026
Married	316	187	76	129	69	
Divorced/widow/single	117	59	24	58	31	
Employed						.0187
Yes	171	109	44	62	33	
No	262	137	56	125	67	
Presence of a regular doctor						<.0001
Yes	339	210	85	129	69	
No	94	36	15	58	31	
Health insurance						<.0001
Yes	349	215	87	134	72	
No	84	31	13	53	28	
Physician recommendation						<.0001
Yes	193	143	58	50	27	
No	240	103	42	137	73	
Symptoms*						.015
Yes	133	64	26	69	37	
No	300	182	74	118	63	
Worry about getting colon cancer						.0004
Somewhat/often/a lot	166	112	46	54	29	
Not at all	267	134	54	133	71	
Thoughts about getting colon cancer						<.0001
Sometimes/often/a lot	97	72	29	25	13	
Not at all	336	174	71	162	87	
Cultural views of healthcare†		M=52.08 (SD 9.46)		M=56.18 (SD 11.06)		<.0001

* Data about symptoms were based on women's self-report rather than clinical information.

† Cultural views are continuous scores ranging from 0 to 100 points. High scores on cultural views indicate a more Eastern view of care; low scores reflect a more Western view of care.

M=mean; SD=standard deviation.

sample was 64 years, ranging from 50 to 89 (standard deviation [SD]=9 years). The majority of participants had a college degree or higher (71%), had health insurance (81%), and were married (73%). Thirty-nine percent were employed. Fifty-seven percent ($n=246$) of the participants were classified as current screeners, and 43% ($n=187$) were noncurrent screeners.

Bivariate Analyses

Bivariate associations between sociodemographics, medical access factors, cancer worry, and cultural variables with colon cancer screening behavior are presented in Table 1. Among the sociodemographic variables, education and employment status were both associated with screening adherence. For medical access factors, current

screeners were more likely to have a regular doctor, health insurance, and physician screening recommendation than noncurrent screeners. The presence of symptoms was also associated with being a current screener. Among the psychosocial and cultural variables, current screeners reported higher levels of cancer worry and thoughts about colon cancer. In addition, noncurrent screeners had significantly higher mean scores on Chinese cultural view tests than current screeners, indicating that noncurrent screeners had a significantly more Eastern view of health care.

Multivariate Analyses

As displayed in Table 2, we tested our hypotheses that culture and cancer worry independently predicted colon cancer screening using logistic regression analysis in which we controlled for other study covariates. Based on bivariate analyses, education and employment status were entered in model 1 as sociodemographic predictors. In this model, education significantly predicted adherence ($P<.0001$), but employment status did not ($P=.31$). In model 2, we retained education and added the medical access factors of health insurance, presence of a regular doctor, and physician recommendation. In model 2, education ($P=.0017$) and physician recommendation ($P<.0001$) were independent predictors of screening. Removing the nonsignificant medical factors of health insurance ($P=.21$) and presence of a regular doctor ($P=.14$) from model 2 resulted in a significant improvement in the model chi-square ($\Delta\chi^2(2)=7.53$, $P<.05$).

In model three, we added our symptom variable to the variables retained from model 2 (education and physician recommendation). Although symptoms were not independently associated with screening adherence ($P=.13$), we felt that the clinical significance of this variable merited including it in all subsequent models. With symptoms in the model, both

Table 2. Summary of statistics of logistic regression models predicting screening behavior between current and noncurrent screeners

Model Construction	Estimated Coefficient	OR	95% CI	Model χ^2	df	$\Delta\ddagger \chi^2$ (vs Compared Model)
Model 1				20.25	1	
Education: >high school (vs ≤high school)	.96	2.62	1.71–4.00			
Model 2				55.00	2	34.75§ (vs Model 1)
Education	.77	2.15	1.38–3.35			
Physician recommendation: yes (vs no)	1.23	3.41	2.25–5.19			
Model 3				57.32	3	2.32 (vs Model 2)
Education	.72	2.05	1.31–3.22			
Physician recommendation	1.22	3.37	2.22–5.13			
Symptoms: yes (vs no)*	.35	1.41	0.91–2.20			
Model 4				71.64	4	14.32§ (vs Model 3)
Education	.62	1.86	1.18–2.94			
Physician recommendation	1.24	3.45	2.25–5.29			
Symptoms	.45	1.57	1.00–2.48			
Thoughts about getting colorectal cancer: somewhat/often/a lot (vs no)	1.00	2.72	1.59–4.67			
Model 5 (final model)				72.34	4	15.02§ (vs Model 3)
Physician recommendation	1.24	3.44	2.25–5.28			
Symptoms	.55	1.74	1.10–2.73			
Thoughts about getting colorectal cancer	1.03	2.79	1.63–4.77			
Cultural view†	-.03	.97	0.95–0.99			

The reference group is current screeners. Nonsignificant covariates and predictors were not retained in each model except controlling for symptoms. The final model was significant at $P<.0001$, indicating a good fit to the data.

* Data about symptoms were based on women's self report rather than clinical information.

† Cultural views are continuous scores ranging from 0 to 100 points. High scores on cultural views indicate a more Eastern view of care; low scores reflect a more Western view of care. For every one-point increase in the cultural scale, the odds of being current screeners were 3% less than being noncurrent screeners.

‡ The symbol (Δ) denotes the differences in likelihood ratio chi-square (χ^2) tests between the tested model and the compared model.

§ $P<.001$.

education and physician recommendation remained statistically significant. On the next step, we entered psychological factors (worry and thoughts about colon cancer) controlling for study variables retained in model 3. Thoughts about colon cancer exhibited a significant independent effect on colon cancer screening adherence ($P=.0081$), but worry was not independently associated with screening ($P=.1593$). Removing worry from the model did not result in a significant change in chi-square ($\Delta\chi^2 (1)=1.99$, $P>.05$). Thus, worry was excluded in the fourth model.

In the fifth model, we entered the cultural scale score. Culture was marginally predictive of screening adherence ($P=.0597$) after controlling for prior variables. Notably, upon entry of cultural scale score, education was no longer

independently associated with screening outcomes ($P=.088$), but symptoms became a significant independent predictor ($P=.0371$). Physician recommendation and thoughts about colon cancer both remained significant predictors of screening adherence.

Given the apparent confounding of the education, symptom and culture variables in the fifth model, we conducted follow-up analyses to explore these associations. We found that culture was highly and negatively correlated with education ($r=-0.41$, $P<.0001$), indicating that women who had a higher educational level were less likely to hold an Eastern view of care. Given the high overlap between culture and education, we tested a final model identical to the fifth model above, retaining the variable of culture but removing that of education. In this final model, culture signif-

icantly ($P=.006$) and independently predicted colon cancer screening outcomes (controlling for physician recommendation, symptoms, and thoughts about colon cancer). The model chi-square was not significantly changed when education was removed from the model ($\Delta\chi^2 (1)=2.9$, $P>.05$). No interaction effect between culture and other independent variables was found.

The results of the final logistic model (Table 2) suggest that women who received a physician recommendation for colon cancer screening had more than three-fold increased odds of being a current screener compared to women who had not received a physician recommendation (OR 3.44; 95% CI 2.25–5.28). Women who sometimes or often thought about the chance of getting colon cancer had about three-fold greater odds of current screening

Table 3. Mean differences in cultural views by women with and without college education

Groups\Outcomes	Current Screeners			Noncurrent Screeners			t Values
	Cultural Views						
	n	M	SD	n	M	SD	
Level of education							
≤High school	51	58.1	10.3	76	62.2	11.2	2.1*
>High school	195	50.5	8.6	111	52.1	8.8	1.5

* P<.05.

M=mean scores on the cultural scale; SD=standard deviation. Higher mean scores on cultural views indicate a more Eastern view of care. Low mean scores on cultural views indicate a more Western view of care.

* $P < .05$.

M=mean scores on the cultural scale; SD=standard deviation. Higher mean scores on cultural views indicate a more Eastern view of care. Low mean scores on cultural views indicate a more Western view of care.

compared to women never thought about colon cancer (OR 2.79; 95% CI 1.63–4.77). Finally, a 10-point increase in Eastern cultural views was associated with a 25% decreased likelihood of being a current screener (OR 0.75; 95% CI 0.74–0.76).

We further conducted a stratified analysis to examine the degree of confounding between education and cultural views. As shown in Table 3, cultural views were not associated with screening among college-educated participants. However, among participants with less education, noncurrent screeners had a more Eastern cultural view than did those who were current screeners.

DISCUSSION

We found that the degree of belief in the Eastern way of care was strongly related to a woman's educational level. Chinese women with lower educational levels were significantly more likely to hold an Eastern view of care and were less likely to adhere to colon cancer screening guidelines than Chinese women with postsecondary education. These data suggest that cultural concepts of health care may be modified by an individual's educational experience. Higher education in modern Chinese society has been greatly influenced by Western science and technology. Chinese-American women with advanced education, especially those who completed their postsecondary education in

the United States, are more likely to be influenced by Western culture and have more opportunities to learn about Western medical care. With an understanding of Western preventive care, diagnosis, and treatment, college-educated Chinese women may be more likely to modify their existing Eastern care structure, utilize Western medical services, and follow its preventive guidelines than high school-educated Chinese women.

Although an Eastern view of care was associated with decreased screening adherence, we found that this association was only present among less-educated participants. In post hoc analysis among college-educated women, adherence to screening was significantly related to physician recommendation and colon cancer awareness (data not shown). These results suggest that efforts to target Chinese women for colon cancer screening will need to consider both their cultural perspectives and educational backgrounds.

Similar to research on other minority populations,^{27–30} the results of this study suggest that physician recommendation is an independent predictor of colon cancer screening in Chinese women regardless of cultural views of care. Chinese culture regards physicians as authority figures.³¹ Chinese women who hold an Eastern view of care and use less Western medical care may be least likely to be exposed to professional recommendation for colon cancer screening. However, our data suggest that when a rec-

Chinese women with lower educational levels were significantly more likely to hold an Eastern view of care and were less likely to adhere to colon cancer screening guidelines than Chinese women with postsecondary education.

ommendation is received, it is typically acted upon regardless of whether the individual has an Eastern or Western view of care. Physicians who are enthusiastic about encouraging patients to obtain timely colon cancer screening may explain the benefits of screening to their patients. Chinese women's misconceptions about colon cancer and screening may be clarified at this time. This encouragement may help Chinese women adapt themselves to Western ways of care by placing more value on Western preventive care, which consequently motivates them to comply with screening guidelines.

We also found that women who worried about developing colon cancer were more likely to obtain timely colon cancer screening than women who were not worried. As has been shown with other ethnic groups,^{32–33} apprehension about having colon cancer was significantly associated with Chinese women's colon cancer screening behavior. These data are also consistent with studies examining the role of worry on other forms of cancer screening.^{22,24,34} Moreover, thoughts about the chances of getting colon cancer appear to be a stronger predictor in the multivariate analyses than explicit worry. Thoughts about colon cancer may represent awareness of the threat. Thus, patients who are aware of the threat may be

more likely to seek screening. Our current cross-sectional data cannot specify the cause and effect between thoughts about colon cancer and screening behavior. However, prior research indicates that emotional factors, such as worry and fear, can facilitate women's behavioral responses to cancer screening and regulate screening behavior in different ethnic groups.³⁵⁻³⁶

Several limitations should be considered in interpreting our results. First, this study was based on a convenience sample of women from the community who volunteered to participate. As a result, the application of these results to the Chinese population may be limited. Individuals who volunteered to participate in this study may have been more interested in learning about colon cancer screening or were more concerned about their health in general. Our sample was not representative in terms of educational level: 71% of our sample reported post-secondary education compared to only 46% of older Chinese women who reported post-secondary education in the 2003 California Health Survey.⁶ Second, this sample was virtually all foreign-born, which limits the study's relevance to other groups of Chinese. Third, results are based on self-report data at one time point. Fourth, our measure of whether a participant was symptomatic or not was imperfect. We attempted to distinguish women who sought true screening from those whose colorectal cancer tests were diagnostic in nature. However, since we based this distinction on a self-report measure, whether the tests reported by these participants were screening or diagnostic tests is unclear. Hence, we chose to include these women in the analyses and control for the variable of symptoms in the multivariate modeling. Finally, this study did not examine the non-screening aspect of colon cancer prevention such as weight control, diet, and exercise. These lifestyle factors are also valued in Chinese culture and are related to the cause of

colon cancer. It is crucial that future research looks into these factors to promote colon cancer prevention in this understudied minority group.

Reducing barriers in Chinese women and promoting their use of colon cancer screening may depend on culturally and linguistically appropriate intervention programs. Very few intervention studies have been designed to counteract Chinese women's psychological and cultural barriers. Our results suggest that interventions directed toward increasing colon cancer awareness and knowledge about Western preventive care through physician recommendations are important to enhance Chinese-American women's adherence to colon cancer screening.

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Appendix D

Developing and Validating a Measure of Chinese Cultural Views of Health and Cancer

ABSTRACT

OBJECTIVE: To develop and validate quantitative scales that measure Chinese cultural views about health and cancer.

METHODS: Cultural views were assessed by a 30-item scale through telephone interview with 438 Chinese-American women aged 50 and older. Cultural subscales were identified using principal component analysis and validated by their associations with age at immigration and breast, cervical, and colorectal cancer (CRC) screening patterns.

RESULTS: The overall scale had good reliability (Cronbach's alpha 0.79). Factor analysis yielded seven cultural subscales--fatalism, hot-cold balance, use of herbs, self-care, medical examination, lifestyle, and Western medicine (alpha 0.39 to 0.82). The majority of the cultural subscales were significantly associated with age at immigration ($p < 0.001$). Fatalism, self-care, and medical examination subscales consistently predicted non-adherence to breast, cervical, and CRC screening recommendations, even after considering other factors.

CONCLUSIONS: Chinese cultural views consist of at least seven domains and may influence older women's breast, cervical, and CRC screening.

WORD COUNT

150

KEY WORDS

Culture, Asian Americans, Women's Health, Mass Screening, Mammography, Vaginal Smears, Occult Blood, Colonoscopy, Sigmoidoscopy

INTRODUCTION

Cultural values have been found to affect cancer communication and screening in several ethnic minority populations. For instance, culturally based fatalistic views about cancer have been reported in African Americans (Jennings, 1997; Phillips, Cohen, & Moses, 1999; Shankar, Selvin, & Alberg, 2002), Latinos (Chavez, Hubbell, Mishra, & Valdez, 1997; O'Malley, Renteria-Weitzman, Huerta, Mandelblatt, & Latin American Cancer Research Coalition, 2002), and Asian Americans (Lee, 2000; Liang, Yuan, Mandelblatt, & Pasick, 2004). Fatalism has also been associated with non-attendance at free breast cancer screening programs for a predominantly Chinese population in Singapore (Straughan & Seow, 2000), use of Pap tests in Cambodian and Latina Americans (Chavez et al., 1997; Taylor et al., 1999), and use of fecal occult blood testing in African Americans (Powe, 1995). In addition, other culture-specific practices and beliefs, such as use of traditional healers and modesty, have been associated with non-use of screening mammography in Filipino- and Korean-American women (Maxwell, Bastani, & Warda, 1998).

Traditional cultural beliefs and values are strongly held, particularly among older Chinese Americans (Mo, 1992). These factors may play a significant role in cancer screening use among older Chinese Americans. Maintaining a lifestyle that emphasizes a hot-cold balanced diet and exercise is a well accepted concept of health among older Chinese Americans; such views may lead to avoidance of preventive medical services (Liang et al., 2004). Modesty is cultural characteristic of traditional Chinese women that can render inappropriate even talking about screening of the cervix or breasts (Mo, 1992; Hoeman, Ku, & Ohl, 1996). Qualitative research suggests that these values may keep Chinese individuals from seeking Western medicine for

help, and they influence conceptions of illness and cancer (Liang et al., 2004; Mo, 1992; Hoeman et al., 1996; Ma, 1999; Yamashiro & Matsuoka, 1997; Vu, 1996).

Although cultural views and values are likely to influence cancer beliefs, attitudes, and behaviors in Chinese Americans, no studies have systematically examined the impact of culture on cancer screening for this ethnic group. One reason for this gap is the lack of valid measures of Chinese culture. The limited qualitative data we have suggest that traditional Chinese cultural views may include several constructs, such as fatalism, a hot-cold balanced diet, conformity with nature, modesty, and self-care to avoid medical visits (Liang et al., 2004; Mo, 1992), and cannot be simply represented by one or two items. This idea is supported by a theory proposed by Chen (1996) that describes perceptions of disease prevention and health promotion among older Chinese Americans. In Chen's model, health is viewed holistically, with the ultimate goal of harmonizing with the environment. The model describes how the Chinese "harmonize with the environment" by adjusting and balancing the "yin-yang" in food intake and exercising regularly outdoors. They "follow the bliss" to react to whatever happen in their lives, which means they passively but positively deal with their destiny. In addition, they "listen to heaven" to accept that life events are already destined to happen and that bad things or illness are a form of punishment. In addition, a positive view about the effect of Chinese herbal medicine and a preference for using Chinese herbs over Western medicine have been identified in older Chinese and Chinese cancer patients (Liang et al., 2004; Simpson, 2003). These ideas are likely to influence use of preventive cancer screening services.

Validated and more comprehensive measures of culture are needed to understand the influence of cultural views on cancer screening, particularly in light of other known factors, such as physician recommendation and health insurance (Urban, Anderson, & Peacock, 1994;

McCarthy, Yood, MacWilliam, & Lee, 1996; Fox, Siu, & Stein, 1994). Although lacks of physician recommendation and health insurance have been found to be important barriers to cancer screening, they cannot explain all variability in screening behavior. Cultural factors, if measured appropriately, will help address this gap in knowledge.

This study was designed to develop and validate quantitative scales to measure Chinese cultural views about health and cancer. Items measuring cultural views were derived mainly from focus group data of older Chinese American women (Liang et al., 2004). We hypothesized that Chinese cultural views comprise several domains, are measurable, and are associated with level of acculturation. We also hypothesized that these factors independently and collectively influence Chinese American women's breast, cervical, and colorectal cancer screening behaviors.

METHODS

This cross-sectional methodological study was part of a larger randomized controlled trial to improve cancer screening use in Chinese American women. The study protocol was approved by the Institutional Review Board at Georgetown University. Data on cultural views and cancer screening were collected through telephone interviews of Chinese American women recruited from local Chinese communities.

Population, Setting, and Eligibility

The study population was Chinese American women residing in the metropolitan Washington D.C. area. Eligibility criteria included being 50 and older and ability to communicate in Mandarin, Cantonese, Taiwanese, or English. Women who were short-term visitors (i.e. those who planned to stay in the U.S. for less than a year) were excluded because a

long-term follow-up is planned to assess use of cancer screening at 15 months following educational interventions and visitors usually do not receive preventive health care in the U.S.

Recruitment and Data Collection

A convenience sample of participants was recruited from several community-based venues, including Chinese churches, senior centers, health fairs, celebration banquets of Chinese organizations, and Chinese print media. Typically, leaders of the organizations endorsed the project and introduced the research team to the congregation or group. The research team then presented a brief overview of the project, including timeline of assessments, receipt of cancer educational materials, and risks and benefits of participation. Women were encouraged to participate to help understand the needs for cancer control in Chinese American women. Interested women were asked to provide a written consent and leave their contact information. Other strategies supplementing the group recruitment method included announcements in church bulletins, invitational flyers or announcements distributed to community organization members, and advertisements posted in local Chinese newspapers and grocery stores. Those women who contacted the research team and expressed their interest in participating in this study were required to mail back a signed consent form. Women providing the written consent received a bottle of brand-name multi-vitamin supplement either on site or by mail as a token of appreciation for participation.

Consenting women were then contacted for a 30-minute computer-assisted telephone interview (CATI) by trained Chinese American interviewers. Interviewers received a one-day training first to get familiar with the survey and CATI system, and their initial interviews were supervised by investigators until they could fluently perform the tasks and handle participants' questions well. Eight people conducted the interviews, including four Mandarin-speaking

graduate students, one research assistant fluent in Mandarin and Taiwanese, and three Cantonese-speaking independent contractors. All, except for one student, were females. The majority of the interviews were conducted in Mandarin. Women who did not speak Mandarin were interviewed in their preferred dialects, such as Cantonese and Taiwanese.

Measures

The telephone survey included questions about demographics, health care access and utilization (e.g., prior cancer screening experience and health insurance), cultural views on health and illness, and knowledge and attitudes towards cancer screening. Women's Chinese cultural views were assessed by 30 items (Table 1). These items were primarily derived from qualitative data of five focus groups consisting of 54 older Chinese American women who were asked about their views of health, illness, cancer, and cancer screening (Liang et al., 2004). In addition, Chen's theory of Chinese American elders' view of health and illness (Chen, 1996) and existing measures, such as beliefs in the balance of "yin and yang" and fatalism (Lee, Lee, & Stewart, 1996; Lannin et al., 1998) were incorporated. Responses to each item were assessed on a 5-point Likert scale, ranging from "strongly agree," "agree," "neutral," "disagree," to "strongly disagree." A proxy for acculturation was the question about immigration history: "How old were you when you came to live in the U.S.?"

Women's history of participation in screening for breast cancer (mammography), cervical cancer (Pap tests), and colorectal cancer (fecal occult blood test, sigmoidoscopy, or colonoscopy) was measured by questions regarding whether they ever had each kind of screening test, the date of the most recent test, and the interval between the two most recent tests (Rakowski, Fulton, & Feldman, 1993). The stages of screening for breast and cervical cancer were categorized as *regular* or *non-regular*. Regular screeners included women who had a mammogram and a Pap

test in the past year and had a previous mammogram and a Pap test within two years prior to the most recent test. Women who had mammograms or Pap tests beyond this time frame or who never had the tests were considered non-regular screeners. The stage of colorectal cancer screening was characterized into two categories as *current* and *non-current*. Based on the recommendations from American Cancer Society (Smith, Cokkinides, & Eyre, 2005), women who had a fecal occult blood test (FOBT) within a year, a sigmoidoscopy within 5 years, or a colonoscopy within 10 years were defined as current screeners. Women were considered non-current screeners if they ever had a colorectal cancer screening test but beyond the recommended intervals or never had any of the three tests. Women were also asked about whether they underwent each screening test for health reasons (i.e., due to symptoms) or for routine checkups. Women who had undergone the tests for diagnostic reasons were excluded from subsequent analyses.

Analyses

In order to identify the key components that explain common and unique variance in our 30 cultural items, we employed principal component factor analysis. SAS statistical software was used to conduct the analyses. Factor rotation and inter-factor correlations were allowed by using the Promax rotation option. Factors were extracted if their eigen values were greater than 1. Items with loading values equal to or greater than 0.4 were retained in corresponding factors.

Internal consistency of items retained in each factor was then examined using Cronbach's alpha. If the overall Cronbach's alpha could be improved by 0.05 or more by eliminating individual items in the factor, these items were dropped from the factor. After determining a final set of items for each factor, items were summed to create the individual cultural subscales. For ease of interpretation, individual item scores were recoded before summing so that higher

scores represented higher Eastern cultural views of health care. The sum score of all cultural subscales was also calculated and compared to sum scores of individual subscales. Next, sum scores were standardized to a range from 0 to 100 points. Records with missing values in more than one-third of the items within one factor were excluded from analyses; otherwise, the prorated factor sum scores were used to maximize the number of subjects in the analyses.

The concurrent validity of these cultural scales was evaluated by their associations with length of time in the US. The predictive validity was examined by associations between cultural subscales and cancer screening behaviors. T-tests were used to examine differences in sum scores of individual cultural factors and the overall seven-factor sum score between women at different screening stages. If sum scores were not normally distributed, non-parametric Wilcoxon tests were used to examine the differences. Finally, logistic regression analyses were performed to preliminarily test the strength of associations between the scales and cancer screening after controlling demographic and health care access variables, including age (< 65 vs. 65 and older), educational level (up to high school vs. college and above), employment status (yes vs. no), health insurance (yes vs. no), and physician recommendation for cancer screening (yes vs. no).

RESULTS

Characteristics of the study sample

Of the 533 women who expressed initial interest in participation, 470 (88.2%) completed a written consent. Of the 470 consenting women, 32 did not complete the telephone interview because of lack of interest when contacted again (N=15), ineligibility (N=7) or they stated they were too busy for the interview (N=3), felt uncomfortable talking about cancer (N=3), or they could not be contacted for an interview (N=4). Overall, 438 (82.2% of 533) Chinese women

constituted the final study sample. About 22% of participants were recruited from Chinese churches, 16% from senior centers or senior assisted living buildings, 37 % from other Chinese community organizations (e.g., alumni associations, community service organizations, and book and dance clubs), 12% from health fairs, and 13% from media or referrals from friends who either participated in or supported this study. Eighteen interviews (4.1%) were administered face-to-face in senior centers (n=14), Chinese schools (n=2) or participants' homes (n=2) because of difficulty in completing the interview over the phone or in reaching the participants by telephone. In addition, 3 participants completed the baseline survey and returned them by mail because they were too busy to set aside time for a telephone interview. A few interviews were conducted in languages other than Mandarin: Twenty-five were conducted in Cantonese, five in Taiwanese, and four in Fuzhou, and two in English.

Of the 438 participants, 437 were foreign born. The only woman born in the U.S. was raised in a Chinese-speaking environment. Among the foreign born women, sixty-one percent were born in China, 3% in Hong Kong, 31% in Taiwan, and 5% in other countries including Singapore and Vietnam. The mean age of the sample was 64 years (standard deviation, SD = 9 years; range: 50 to 89 years). The majority of participating women had a college degree or higher (71%), had health insurance (80%), and were married (73%). Thirty-nine percent were employed. The mean age upon immigration was 42 years (range: 0 to 80 years). About 60% of the participants had a mammogram within the past two years and 64.2% had a Pap test within the past three years. Fifty percent of the participants regularly obtained mammograms or Pap tests, and 75.8% ever obtained at least one of the three colorectal cancer screening tests (i.e., FOBT, flexible sigmoidoscopy, and colonoscopy); 26.2% received the test due to symptoms or problems, and the remainder were for screening.

Factor analysis results

Results from principal components analysis initially extracted 9 factors. We reviewed the loadings of items and considered the theoretical connection between items within factors. Items that either loaded less than 0.40 in any of the factors or had theoretically weak associations with other items in the factor were eliminated for the analyses. For instance, the item describing avoidance of medical visits in order not to become sick or have bad luck was deleted due to low loading values on any of the factors. Items on eating prepared food and body type and illness were clustered together at 0.58 and 0.76 and formed one factor, but this factor was excluded because no meaningful construct could emerge from these two items. The item about Qi-Kung or Tai-chi practice loaded at 0.82, was not considered for further analyses because it was the only significantly loaded item in that factor.

After these deletions, data were analyzed again using principal components analysis with Promax rotation. The results showed that the remaining 26 items significantly loaded on seven common factors (Table 2). The first factor contained nine items, all of which were related to individuals' perception that health and illness are predetermined and beyond their control. This factor was labeled as "fatalism." "Use of herbs" contained three statements about the advantage of using Chinese herbal medicine to stay healthy; "self-care" contained three statements that emphasized taking care of one's self as opposed to depending on doctors; "lifestyle" represented the notion of keeping healthy through outdoor exercise, balanced diet, regularity, and maintaining emotional stability. "Medical examination" contained statements about negative perceptions about medical examination. "Hot-cold balance" represented the belief about the importance of a hot-cold balanced diet in health maintenance. "Western medicine" consisted of two items about negative impressions of Western medicine--the use of chemical components that

may harm the body and the inability to prevent disease. After rotation, the seven factors were distinct from each other and the correlations between the factors were low to moderate (Range: 0.01 to 0.31). Analyses using an orthogonal rotation (i.e., Varimax rotation in the SAS program) yielded the same seven factors.

Reliability (internal consistency)

The statement “I know my body better than any one else.” was eliminated from the “self-care” factor since dropping this item increased the inter-item correlation for this subscale (Cronbach’s alpha) from 0.63 to 0.73. The reliability of the overall seven- factor (25 items) sum scores were 0.79 (Table 3). The Cronbach’s alphas in the “fatalism” and “self-care” factors were 0.82 and 0.73, respectively. The intra-item correlations among items in the “use of herbs” and “lifestyle” factors were moderate (Cronbach’s alpha= 0.69 and 0.59, respectively), but were low in the “hot-cold balance,” “medical examination” and “Western medicine” factors (Cronbach’s alpha=0.53, 0.42, and 0.39, respectively).

Concurrent validity

Except for “lifestyle,” “medical examination” and “Western medicine” factors, individual factor and overall sum scores were significantly associated with participants’ age upon immigration to the U.S. (Spearman correlation coefficient between 0.17 and 0.34, $p<0.001$); women who held stronger Chinese cultural views were more likely to have come to the U.S. in the later years of their life (Table 3).

Preliminary predictive validity

The seven-factor (25 items) sum scores significantly differentiate women of different breast, cervical, and colorectal cancer screening histories (Table 4): women who did not obtain regular mammography and/or regular Pap tests were likely to have a more traditional Chinese

cultural views than those having regular mammography and/or Pap tests (t-tests, $p<0.0001$).

Similarly, those whose colorectal cancer screening tests were not current held a more traditional cultural view than those never having or having current colorectal cancer screening (t-test, $p<0.01$).

Of the seven cultural scales, fatalism and self-care were the two strongest factors differentiating women having regular and non-regular breast and/or cervical cancer screening tests. Women who did not adhere to breast and cervical cancer screening recommendations were more likely to have a fatalistic view, to emphasize self-care, and to ignore the importance of medical checkups ($p<0.0001$). The “use of herbs,” “hot-cold balance,” and “medical examination” factors had a similar effect on breast and cervical cancer screening as those found in the “fatalism” and “self-care” factors, but with a lesser degree of significance. Similar to those found in breast and cervical cancer models, the “fatalism” and “self-care” factors were associated with colorectal cancer screening, with the non-current screeners having higher mean scores than current screeners (45.1 and 50.7, compared to 38.8 and 40.0; t-tests, $p<0.001$).

After controlling for age, education level, employment status, health insurance, and physician recommendation, the fatalism, self-care, and medical examination subscales and the overall 7-factor sum score remained significantly associated with regular use of mammography and Pap tests ($p<0.01$ for all but the association between self-care and Pap test, which had a p value of 0.03). On the other hand, after considering these factors, none of the subscales or the overall sum score significantly predicted colorectal cancer screening.

DISCUSSION

To our knowledge, this is the first study to develop a measure of Chinese cultural views on health and illness and to validate cultural scales by testing their association with Chinese

women's breast, cervical, and colorectal cancer screening. Our findings suggest that Chinese cultural views consist of at least seven domains that may influence older women's use of cancer screening tests to differing degrees.

The seven subscales identified from our study captured important aspects of Chinese cultural views on health and illness. The subscales of self-care, hot-cold balance, and use of herbs are specifically relevant to Chinese culture. Although fatalism has been reported in African Americans and Latinos (Jennings, 1997; Phillips, Cohen, & Moses, 1999; Shankar, Selvin, & Alberg, 2002; Chavez, Hubbell, Mishra, & Valdez, 1997; O'Malley, Renteria-Weitzman, Huerta, Mandelblatt, & Latin American Cancer Research Coalition, 2002), the connotation of this construct may vary among different cultural groups; therefore, measures of fatalism may need to be tailored to fit specific cultures. For instance, measures of fatalism in Hispanic and African Americans would include questions that emphasize the role of God in causing and curing cancer (Austin et al., 2002; Holt, Clark, Kreuter, & Rubio, 2003; Kinney, Emery, Dudley, & Croyle, 2002; Pérez-Stable, Sabogal, Otero-Sabogal, Hiatt, & McPhee, 1992). In Chinese women the concept of fatalism is more closely aligned to "luck" and "destiny" than religion. Likewise, the subscales of lifestyle, medical examination, and Western medicine may represent views that are shared by other cultural groups. However, these scales were specifically developed for the Chinese population by applying Chinese cultural theories and qualitative data from older Chinese Americans. For instance, the emphasis on outdoor walking and Tai-Chi reflects the idea of harmonizing with the environment (Chen, 1996), and embarrassment by medical examinations is a measure about modesty. It is possible that some of these cultural scales could be applied to other cultural and ethnic groups, especially to other Asian Americans who came from countries that were also influenced by Chinese culture. Future cross-cultural

research is needed to test the generalizability and specificity of these cultural constructs to other cultural groups. If this instrument can be used in other cultural groups, it is likely that programs to improve cancer screening adherence in these cultural groups could be combined in a culturally appropriate way.

Predictive validation tests further indicate that the values captured by these seven cultural subscales have different degrees of influence in Chinese women's cancer screening behaviors. The significant relationship between the fatalism subscale and breast and cervical cancer screening in our Chinese population was consistent with prior research on the effect of fatalism on cancer screening in other Asian, African American, and Latino populations (Chavez et al., 1997; Straughan & Seow, 2000; Taylor et al., 1999; Powe, 1995). The consistently strong association between fatalism and screening outcomes is likely also a reflection of the higher internal consistency of this subscale relative to the other subscales described here.

Although exercise, diet, and the emphasis on social and emotional health clustered together, these "lifestyle" values did not predict cancer screening. It is possible that the potential association between "lifestyle" and screening may have been somewhat attenuated by the low reliability of the subscale and the fact that most of the participants agreed to the general concept that a healthy lifestyle is a key to health. On the other hand, more specific concepts about food, such as the importance of choosing the right food to maintain the hot and cold balance of the body, were associated with cancer screening behaviors. In Chinese culture, foods are labeled as hot or cold based on their effects on the body, not necessarily by the temperature when served. People with a hot body type need to consume cold food (e.g., Napa cabbage and mung beans), and those who are weak or feel cold need hot food (e.g., beef and ginger). This concept is influenced by the teaching of Taoism, which divides the universe into two opposite characters--

“yin” and “yang.” “Yin” is cold, dark, passive, and weak, whereas “yang” denotes the hot, light, active, and strong side of a person (Mo, 1992). The ability to balance “yin (cold)” and “yang (hot)” is considered the optimal way to achieve health and prosperity. Women who believed in the hot-cold balance of the body had impression that they were healthy as long as their diet was balanced. This culture-specific belief may explain why these women were less likely to adhere to breast and cervical cancer screening guidelines.

We found associations between adverse impressions of Western medical examinations (embarrassment, lots of unnecessary tests, and intrusiveness) and non-adherence to regular breast and cervical cancer screening. This result is consistent with limited studies that have found that the invasive nature of Western medical approaches keeps some Chinese women from seeking recommended care (Ma, 2000). On the other hand, having a negative attitude toward Western medicine, as captured in the Western Medicine subscale, was not associated with screening outcomes. Again, in interpreting the absence of an association here, it is important to consider the extremely low reliability of the subscale. However, beyond low reliability, the lack of association may be because screening tests are medical examinations and does not involve medications. A negative view about Western medicine, therefore, did not predict women’s use of cancer screening services.

Although some cultural subscales show significant associations with colorectal cancer screening behavior, the associations are moderate compared to those found with breast and cervical cancer screening and become insignificant after taking into account important demographic and health care factors. It is possible that the influences of cultural factors on cancer screening are more evident in screening adherence, a stage that is not available in our current colorectal cancer screening data. In addition, subset analyses of our data show that

women whose colorectal cancer screening tests were not current had the highest cultural scores than those having current tests or never having any tests. It is likely that traditional Chinese cultural views keep women from repeating screening tests, and that other reasons, such as lack of knowledge about screening recommendations, contribute to women's never having had any colorectal cancer screening.

Several limitations of this study should be considered when interpreting the results. First, the cultural view scales were developed primarily from responses of Chinese American women aged 50 and older to questions regarding their perceptions about health and illness/cancer and their experiences in health care in the U.S. (Liang et al., 2004). It is possible that other aspects of cultural views held by Chinese Americans were not captured. However, if these seven domains of cultural views remain stable after being tested in different groups of Chinese women, it is unlikely that any unidentified domains will alter the relationships between these seven factors and cancer screening. Second, except for the fatalism scale, these cultural scales only included two to three items, which may partly explain moderate to low intra-item reliability among items in these subscales. Future research is needed to improve reliability of these specific cultural scales. Possible approaches include adding more items to the scales and collecting data in larger samples to improve internal consistency. Third, the low reliability of several of the subscales likely attenuated their associations with our screening outcomes. However, the overall scale had acceptable reliability. Thus, some investigators may wish to consider using the overall scale score rather than focusing on individual subscales. Fourth, the generalizability of this study is limited by the use of a convenience sample drawn mainly from Chinese community organizations, churches, and senior centers. In addition, the majority of the study participants had an educational level of college or higher and had health insurance, which may explain their

higher colorectal cancer screening rates than those of a national sample of Asian Americans (Swan et al., 2003). Although mass media were used to encourage participation, relatively small numbers of women participated through this channel. Therefore, women who did not attend any activities or programs held by Chinese organizations, such as restaurant workers or those speaking in other Chinese dialects, are likely to be underrepresented in our sample. Cultural patterns as well as their associations with cancer screening behaviors may be different if these people are included. The stability and generalizability of the cultural scales needs to be tested in men and Chinese populations in other geographic areas. In addition, measures of cancer screening behaviors are subject to self-report bias.

IMPLICATIONS

Despite these limitations, our findings of the associations between cultural views and cancer screening practice have important implications for research and practice. Cancer screening programs targeting Chinese women may be more successful if they acknowledge women's cultural barriers and include messages that address those cultural factors. Research is needed to explore how the concept of early detection can be accepted by women holding a fatalistic outlook. Likewise, health care providers should be sensitive to the cultural values of their Chinese patients, especially those who are older immigrants, and address their concerns that may keep them from following advice to get mammograms and Pap tests. Studies should explore prospects for education and/or counseling interventions that would improve Chinese women's cancer screening adherence in large representative samples. In addition, since screening behaviors are also influenced by other factors, such as knowledge about cancer and cancer screening, perceived risks of getting cancer, cancer worry, and transportation and

language barriers, it is necessary to test whether the relationships between cultural views and cancer screening still hold true after considering those important mediating factors.

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Table 1 Items used to construct scales of Chinese cultural views of health and cancer.

	Item
MEAN_CAN	If I am meant to get cancer, I will get it.
DEAL_CAN	If we get cancer, the best way to deal with it is to accept it, just like the old saying: "Listen to heaven and follow fate."
ILL_FATE	Health or illness is a matter of fate. Some people are always healthy; others get sick very often.
NO_CONTL	I cannot control my destiny.
LUCK_CAN	Avoiding cancer is a matter of personal luck.
MATT_CAN	No matter what I do, if I am going to get cancer, I will get it.
PREV_CAN	It is hard to prevent cancer.
DEAD_CAN	Getting cancer is like being sentenced to death.
THNK_CAN	It is best not to think about cancer. If we think about it too much, we probably will get cancer.
PREV_HRB	Herbs are a better choice for preventing diseases than western medicine.
HRMN_HRB	Herbs are more effective in harmonizing a person's yin-yang than western medicine.
RMDY_HRB	Herbs are better remedy for illness than western medicine.
CARE_SLF	As long as I can take good care of myself and keep myself healthy, I don't need to see a doctor.
VISIT_MD	I don't visit doctors if I'm not feeling sick.
BDY_BEST	I know my body better than any one else.
FOOD_BAL	Certain food is not good for me because it will disturb the hot-cold balance in my body.
DIS_IMBL	Most diseases, excluding external wounds, are caused by the imbalance between hot and cold in a person's body.
FOOD_STR	Eating "cold" food in summer and "hot" food in winter will help strengthen my body.
REG_HLTH	Regularity in meals and daily schedules can make us healthy.
HPY_HLTH	Keeping my mind happy, doing my hobbies, and not competing with others can lead to better health.
REG_WALK	Regular outdoor walking is essential to achieve good health.
EMB_CHKS	I will be embarrassed if a doctor or a nurse checks my private parts.
MED_TEST	A lot of medical tests are too intrusive and make me uncomfortable.
DOC_TEST	Medical doctors usually do unnecessary tests.
MED_CHEM	We should not take "western" medicine too often, because its chemical ingredients will hurt our bodies.
MED_RREV	Western medicine is good for killing germs rather than preventing diseases.
FOOD_KEY	Eating food prepared by myself is a key to good health.
BODY_CAN	Bodily constitution is different for every person; therefore, some kinds of people are more likely to get cancer than others do.
BAD_LUCK	Going to clinics or hospitals too often will cause me to catch diseases or having bad luck.
QI_KUNG	Qi-Kung or Tai-Chi practice can help regulate the "chi" in the body, which can increase one's stamina and prevent diseases.

Table 2 Factor loadings of cultural subscales.

Item	Fatalism	Use of Herbs	Self-care	Hot-cold Balance	Lifestyle	Medical Examination	Western Medicine
MEAN_CAN	0.78						
DEAL_CAN	0.71						
ILL_FATE	0.67						
NO_CONTL	0.54						
LUCK_CAN	0.55						
MATT_CAN	0.67						
PREV_CAN	0.65						
DEAD_CAN	0.57						
THNK_CAN	.48						
PREV_HRB		0.80					
HRMN_HRB		0.76					
RMDY_HRB		0.73					
CARE_SLF			0.71				
VISIT_MD			0.70				
BDY_BEST			0.71				
FOOD_BAL				0.81			
DIS_IMBL				0.591			
FOOD_STR				0.400			
REG_HLTH					0.73		
HPY_HLTH					0.76		
REG_WALK					0.70		
EMB_CHKS						0.68	
MED_TEST						0.55	
DOC_TEST						0.64	
MED_CHEM							0.68
MED_PREV							0.76

Principal component factor analysis with Promax rotation

Table 3 Characteristics of cultural subscales.

Sum Score	Fatalism	Use of herbs	Self-care	Hot-cold balance	Lifestyle	Medical examination	Western medicine	Sum score of the seven subscales
Number of items	9	3	2*	3	3	3	2	25
Mean	41.1	49.0	44.2	54.0	89.6	46.4	58.1	51.7
Range	2.8-97.2	0-100	0-100	0-100	50-100	0-91.7	0-100	15-87
Standard deviation	17.9	18.4	27.7	18.3	10.6	18.2	21.5	11.1
Cronbach's Coefficient Alpha (standardized)	0.82	0.69	0.73	0.53	0.59	0.42	0.39	0.79
Correlation** with acculturation (Age coming to U.S.)	0.25 p<0.0001	0.17 p=0.0005	0.34 p<0.0001	0.20 p<0.0001	0.01 p=0.78	-0.03 p=0.53	0.08 p=0.08	0.29 p<0.0001

* BDY_BEST was excluded to increase the Cronbach's Alpha from 0.628 to 0.727

** Spearman correlation coefficients.

Table 4 Associations between subscale and scale scores and breast, cervical, and colorectal cancer screening.

	Mammography		Pap Test		Mammography and Pap Test		Colorectal Cancer Screening (FOBT, Flexible Sigmoidoscopy, or Colonoscopy)	
	Regular	Non-regular	Regular	Non-regular	Regular	Non-regular	Current	Non-current
	N=206	N=197	N=212	N=202	N=156	N=226	N=182	N=169
Cultural subscale (Mean)								
Fatalism	35.9****	46.6****	36.1****	46.3****	35.6****	45.4****	38.8**	45.1**
Use of herbs	47.2*	51.7*	46.6*	50.5*	46.9*	50.4*	48.2	50.0
Self-care	34.7****	53.7****	34.8****	53.8****	33.1****	52.2****	40.0**	50.7**
Hot-cold balance	51.4**	56.8**	51.8*	55.8*	49.9***	56.7***	53.0	54.6
Lifestyle	89.3	89.2	89.9	89.4	89.4	89.1	89.7	89.2
Medical examination	43.5**	49.2**	44.7*	48.5*	43.7**	48.5**	44.8*	48.6*
Western medicine	58.2	59.3	58.3	57.7	58.9	58.5	56.7	60.3
Overall 7-factor sum scores (Mean)								
7 factors (25 items)	48.1****	55.4****	48.4****	55.0****	47.7****	54.6****	50.0****	54.2****

* 0.01 < p ≤ 0.05

** 0.001 < p ≤ 0.01

*** 0.0001 < p ≤ 0.001

**** p < 0.0001

Notes:

- (1) On a scale of 0-100, with 0=low traditional Chinese cultural view and 100=high traditional Chinese cultural view.
- (2) T-test was used to detect group differences in all scores except for the “self-care” and “lifestyle” factors due to non-normal distributions of the scores; instead, the non-parametric Wilcoxon tests and Kruskal-Wallis tests were used.

(3) Women who had cancer or were tested due to symptoms were excluded from analysis (35, 24, 56, 87 excluded for breast, cervical, breast and cervical, and colorectal cancer analyses, respectively).

(4) “Regular” screeners were those who had a mammogram and/or a Pap test in the past year and had another same test within two years prior to the most recent test; the rest of the participants were “non-regular” screeners. Women who had a fecal FOBT within a year, a sigmoidoscopy within 5 years, or a colonoscopy within 10 years were “current” screeners; the rest of the participants were “non-current” screeners.

Appendix E

Running head: Breast cancer educational video for Chinese women

Development and Evaluation of a Culturally-Tailored Educational Video: Changing Breast
Cancer Related Behaviors in Chinese Women

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this video.

Abstract

This study developed and evaluated a culturally tailored video guided by the Health Belief Model to improve Chinese women's low use rate of mammography. Focus-group discussions and an advisory board meeting were held to guide the video development. A 17-minute video including a soap-opera and physician recommendation segment was made in Chinese languages. A pre-post test pilot was conducted to evaluate the efficacy of the video in changing knowledge, beliefs, and screening intentions among Chinese women (age \geq 40) who were not adherent to current National Cancer Institute's mammography guidelines (n=52). The results showed that the video significantly increased non-adherent Chinese women's screening intentions, knowledge, perceived risk for breast cancer, and perceived benefits of mammography. Chinese immigrant women were less likely to hold an Eastern view of healthcare and report barriers to screening after viewing the video. This video might have the potential to increase adherence to mammography screening in Chinese women.

Key words: Culturally tailored video, Chinese women, Breast cancer screening, Health beliefs

Development and Evaluation of a Culturally-Tailored Educational Video:

Changing Breast Cancer Related Behaviors in Chinese Women

Asian American women have the lowest rates of mammography use of all ethnic groups in the U.S. (Lillie-Blanton, Rushing, & Ruiz, 2003; Kagawa-Singer & Pourat, 2002; University of California, Los Angeles (UCLA) Center for Health Policy Research (CHPR), 2005). Chinese-American women have an even lower rate of screening than their Asian counterparts such as Filipino, Japanese, and Vietnamese women (UCLA-CHPR, 2005). The low rate of mammography use in Chinese women might be associated with their demographic and cultural characteristics.

Chinese Americans are the largest Asian immigrant population in the U.S. and 70.8 percent of this population is foreign-born (U.S. Census Bureau, 2000). More than 85 percent of Chinese Americans do not speak English at home and up to 50 percent do not speak English fluently. Chinese Americans also have a higher poverty rate (13.5%) than the general U.S. and Asian populations (12.4% and 12.6%, respectively) (Reeves & Bennett 2004). Chinese Americans who are poor and have limited English proficiency are often reluctant to seek Western health care (Facione, Giancarlo, & Chan, 2000; Ma, 1999; & Mo, 1992).

Chinese Americans also have different cultural practices of health care. They hold a holistic concept of health, believing that physical health is connected with emotional harmony and “Chi” balance in the body. Chi is a Chinese concept of energy including yin-Chi and yang-Chi. According to this concept, excess of either type of Chi may result in physical vulnerability (Hwu, Coates, & Boore, 2001). To achieve balance, people can practice self-care through consuming a yin-yang balanced diet, regular exercise, and having an optimistic state of mind (Holroyd, 2002; Liang, Yuan, Mandelblatt, & Pasick, 2004). Traditional Chinese also use

Chinese therapeutic herbs in cooking in order to achieve yin-yang balance against diseases (Holroyd, 2002; Simpson, 2003). They believe that these self-care practices are natural and essential to prevent diseases. Several qualitative studies report that older Chinese women view Western biomedicine as efficient in treating disease, but with harmful side effects to the body (Facione et al, 2000; Holroyd, 2002; Liang et al, 2004). These Chinese cultural health beliefs may affect Chinese Americans' tendencies to seek Western preventive screening, especially when they consider cancer as a fatal disease and unpreventable.

Research increasingly shows that in addition to lack of insurance, underutilization of cancer screening in Chinese women is associated with Eastern cultural views of care, English deficiency, negative beliefs and attitudes, and low knowledge (Tang, Solomon, & McGracken, 2000; Tu, Yasui, Kuniyuki, Schwartz, Jackson, Hislop, & Taylor, 2003; Wang, Liang, Chen, Cullen, Feng, Yi, Schwartz, Mandelblatt, 2006; Yu, Hong, & Seetoo, 2003; Yu, Kim, Chen, & Brintnall, 2001). For example, Chinese women who held Eastern views of health care and were less proficient in English were found to be less likely to have obtained a recent cancer screening (Tang et al., 2000; Wang et al., 2006; Yu et al., 2001). Chinese women were disinclined to seek cancer preventive care when they viewed themselves at lower risk at developing cancer (Facione et al, 2000; Tang et al., 2000; Tu et al., 2003), perceived less benefit of Western preventive care (Liang et al, 2004; National Cancer Institute (NCI), 1999; Stranghan & Seow, 2000; Yu et al., 2001), and had less knowledge and greater misconceptions about cancer and screening (Jackson, Hislop, Tech, Yashi, Tu, Kuniyuki, Jackson, & Taylor, 2003; Liang et al., 2004; Wong-Kim, Sun, & Demattos, 2003; Yu et al., 2003;). Although these barriers are recognized as contributing to Chinese women's lower use of cancer screening, there have been few intervention programs

designed to reduce barriers to screening mammography and even fewer interventions that have been tailored to Chinese women's cultural needs.

To fill this gap, we created a theoretically guided, culturally sensitive, and linguistically appropriate educational video for Chinese women to promote their use of mammography. This video was designed to target both culturally specific barriers (e.g., Eastern cultural views of healthcare) and more general barriers (e.g., low perceived risk). We were guided by the health belief model (HBM) not only because the HBM components explain women's use of mammography (Aiken, West, Woodward, & Reno, 1994; Austin, Ahmad, McNally, & Steward, 2002), but also because the HBM addresses specific beliefs and barriers to cancer screening found in Chinese populations. Based on feedback from focus groups, we used a soap-opera style narrative in the video. This format has been successfully utilized to increase rates of mammography screening among African American, Hispanic, and White women (Davis, Berkel, Connie, Nandy, Jackson, & Murphy, 1998; Jibaja, Kingery, Neff, Smith, Bowman, & Holcomb, 2000) and Pap test screening among Chinese women (Taylor, Hislop, Jackson, Tu, Yutaka, Schwartz, Tec, Kuniyuki, Acorda, Marchand, & Thompson, 2002). Further, based on extensive evidence documenting the impact of physician screening recommendations (Austin et al., 2002; Slenker & Grant, 1989; Smith, Phillips, & Price, 2001; Tang et al., 2000; Tu et al., 2003; Wang et al., 2006), we included a segment with a Chinese female physician recommending use of mammography for immigrant Chinese-American women.

In this paper, we present a preliminary evaluation of the video in a community sample of Chinese women who had not ever had a mammogram or who had not received a mammogram in the past two years (hereafter referred to non-adherent women). We hypothesized that the video

would reduce Chinese women's barriers to breast cancer screening and this, in turn, would increase their intention to obtain a mammogram.

Methods

This study was conducted in three phases: 1) a formative phase to identify the themes and format for the video, 2) a production phase that involved collaboration with our local Chinese communities and the video company, and 3) a quantitative phase that evaluated the acceptability and effectiveness of the video using a pre-post test design. This study was approved by the Institutional Review Board at Georgetown University.

I. Formative phase: Focus-group discussion and advisory board meeting

We first conducted focus-group discussions to gain a first-hand understanding of Chinese women's culturally-based views of breast cancer, attitudes toward mammography, and preferred content and format of the video intervention. Then, we held an advisory board meeting consisting of Chinese community health leaders who have been involved in cancer care and Chinese women's health.

Focus-group discussions. We conducted four focus groups: two high-acculturation and two low-acculturation groups. Acculturation level was defined by the number of years (more or less than 10 years) in the U.S. and ability to speak English. Women with a U.S. residency over 10 years and proficiency in English were considered to be highly acculturated. Although other measures have been used to define the concept of acculturation, such as self-identification, lifestyle, friendship, and neighborhood (Burnam, Hough, Karno, Escobar, & Telles, 1987; Suinn, Ahuna, & Khoo, 1992), we used English language and US residency as a proxy for acculturation because these markers have been widely used, are easily assessed, and have been found to correlate highly with screening mammography use (O'Malley, Kerner, Johnson, & Mandelblatt,

1999; Yu, Seetoo, Tasi, & Sun, 1998). Further, language proficiency has been found to account for a large amount of the variance in acculturation (Anderson, Moeschberger, Chen, Kunn, Wewers, & Guthrie, 1993; Marin, Sabogal, Marin, Otero-Sabogal, & Perez-Stable, 1987) and length of residency is highly correlated with acculturation scales (Marin et al, 1987; Meredith, Wenger, Liu, Harada, & Kahn, 2000).

Eligibility criteria for all focus groups were women aged 40 and over, having had no history of breast cancer, and never having participated in our previous projects. Women were recruited from various Chinese community activities, through posted recruitment flyers, and through the web sites of Chinese organizations in the metro DC area (including the District of Columbia and suburban Maryland and Northern Virginia). The 2000 census data indicates that approximately 60,000 Chinese live in this metro area. Among these 60,000, approximately half are women and approximately 44% of these women are over the age of 40. A total of 128 women responded to our calls for participation (4% responded to flyers and 96% from public events). Among the 128 women, 107 were eligible (84%). We randomly selected 20 highly-acculturated and 20 low-acculturated women at different stages of mammography use (ever, never, and regularly screened) and assigned them to four focus groups (10 women per group). Women in each focus group had a similar distribution of screening stages. Efforts were made to ensure that each group had similar distribution of age.

Thirty-six of the 40 (90%) eligible women participated in the focus-group discussions. The two high-acculturation groups consisted of a total of 17 women (mean age = 46) who had lived in the U.S. for 13 years on average. The two low-acculturation groups included a total of 19 women (mean age = 58) who resided in the U.S. for a mean of 4 years. The high-

acculturation groups were younger because there were few women over the age of 50 who were highly acculturated. Each participant received a \$20 cash incentive after the group.

In all focus groups, regardless of level of acculturation, participants reported feeling that they had less risk and threat for developing breast cancer (perceived susceptibility and seriousness) than White women. They were concerned that the radiation and pain from mammography would be harmful to the body (perceived benefits and barriers). They mentioned that natural approaches such as eating healthy (i.e., Chinese diet having more vegetables and soy, less fried and junk food), exercising (i.e., chi-kung), and being optimistic were means to prevent cancer. Many low-acculturated women thought the use of monthly self-examination plus natural approaches was sufficient to maintain their health. Those women who never or rarely go for mammograms said that they were healthy and unlikely to get cancer since they had not had any physical symptoms and family cancer history. Some thought that getting cancer was a function of genetics and body constitution that is predestined. Many attributed breast cancer risk to the stresses that are associated with overcoming challenges in a new and different cultural environment and to changes in their dietary habits (e.g., eating more hormone-injected food like milk and chicken that might upset the balance of hormones in the body). Low-acculturated women stressed that long work hours, high medical costs in the U.S., and difficulty in communication with Western practitioners greatly reduced their desire to obtain a mammogram. When asked about preferred educational modality, participants clearly favored a video that included recommendations from a physician plus real-life survivor stories.

Advisory board meeting. Advisory board members were subsequently convened to discuss the focus-group results and to identify appropriate themes and format of the video. They all had backgrounds in Chinese culture and were able to speak Mandarin. The board included

three medical professionals (an oncology nurse and two physicians), three Chinese-American cancer control researchers, four community health leaders, two breast cancer survivors, two representatives of the acting group, and a script writer who was a breast cancer survivor as well. Each board member was reimbursed \$50 dollars for their time.

The advisory board discussed a preliminary script that would connect the conceptual framework of HBM and the cultural views and barriers from the focus groups. Based on the discussions, the advisory group recommended a video consisting of two parts: a 10-12 minute story targeting Chinese women's cultural beliefs and barriers to breast cancer control, and a 5-minute physician recommendation focusing on informational knowledge, clarification of misconceptions, and screening guidelines. They suggested that a suitable and engaging storyline for our Chinese audience incorporate a background of family and social support and have a humorous and positive tone. The script was developed and revised six to seven times in an iterative fashion with the board providing feedback from each draft. We also revised the script based upon cognitive laboratory testing in which we solicited other lay Chinese women's comments on the script. The script for the physician recommendation segment was developed in collaboration with the acting physician and researchers based on the focus-group and board meeting results.

II. Production of the video: Academic-community collaboration

Building on a story line about surviving breast cancer, a bilingual production team collaborated with local Chinese to produce the video. Performed by a Chinese drama club, the story opens with a surprise birthday party for a 50-year old woman who had been diagnosed with breast cancer five years earlier. The ladies chatter about myths related to breast cancer and its early detection. Different beliefs and attitudes come forward in the narratives-- from personal

aversion to the experience of a mammogram to traditional Chinese views, especially those of husbands uneasy with the subject. The script is written to Chinese sensitivities and concerns about cancer.

The actors rehearsed the script and discussed their performance with the leading researcher and director of the video producer. The video producer was experienced in filming health-related topics and had bilingual members with Chinese cultural background to direct the shooting. We used the house of a Chinese volunteer as our setting.

Following the narrative segment, a Chinese female physician reassured the viewers that breast cancer can be found early and that the cure rate of early stage breast cancer is up to 90%. The physician used statistical resources to explain breast cancer risk in Chinese-American women and a breast model to demonstrate how mammography can detect very small breast cancers that cannot be felt by hands. She stressed that early breast cancer is asymptomatic. Using clips of a mammography machine and film, she explained why it is necessary to compress the breasts during mammography. She emphasized that it is worth the brief discomfort of a mammogram in order to ensure breast health. She also provided comparisons to clarify that the amount of radiation exposure via mammography is too low to affect our health. At the end, the physician urged all women 40 and over to be screened and provided information about insurance coverage of mammography screening and county health programs where women could obtain a free or low-cost mammogram.

Actors and the physician spoke Mandarin while shooting. To reach more Chinese women we created a dubbed Cantonese version. We also added English subtitles for the second-generation children to talk to their immigrant mothers about breast cancer screening. The final video was 17-minutes in length and was produced in both DVD and VHS format.

III. Quantitative phase: Process and Outcome Evaluation

Recruitment and data collection. We conducted a pilot test of the video in a convenience sample of 52 Chinese-American women who did not participate in the focus-group discussions. Women were recruited from the metro DC area following the same methods described in the focus-group section. Women were considered eligible if they were age 40 and older and non-adherent to the National Cancer Institute's screening mammography guidelines. We approached 225 women (97% on recruitment sites and 3% via telephone as referred by their relatives and friends). Ninety of the 225 women met our criteria for eligibility and 58% of the ninety ($n = 52$) consented to participate in the study.

Upon receipt of consent, we interviewed participants via telephone to obtain baseline data. Then, we mailed the video to the participants in response to their preference of a DVD or VHS format. Overall, 84% of the participants watched the Mandarin version and the rest viewed the Cantonese version. We contacted the women two weeks after mailing to confirm the receipt and viewing of the video. Women who had not viewed the video were reminded to do so. Participants were interviewed approximately one week after viewing the video. All surveys were conducted either in Mandarin or Cantonese. Two participants responded to the follow-up survey in English via email since they were too busy to be interviewed via telephone. The baseline and follow-up interviews averaged 30 minutes. Participants completing both interviews received \$10 cash incentives.

All 52 women completed the baseline. However, 6 (12%) participants failed to complete the follow-up assessment due to their telephone being disconnected ($n = 2$), being out of town during the follow-up period ($n = 2$), inability to contact after 15 attempts ($n = 1$), or being sick ($n = 1$). Two participants who had a mammogram right after answering the baseline survey but

before seeing the video were excluded. Thus, the final evaluation sample included 44 women for both pre and post tests.

Measure. We used validated questionnaires to assess our primary outcome variable (mammography intentions) as well as barriers to cancer screening. Some baseline measures including intention, knowledge, health beliefs, cultural views, were repeated in the follow-up assessment to evaluate changes after intervention.

Screening intention. We measured women's intention with the following question: "Do you plan to obtain a mammogram next year? Yes/No". In the follow-up interview, we also asked women to what extent the video has influenced their screening intention: not at all, a little, some, very, or extremely.

Knowledge. We measured knowledge of screening guidelines, breast cancer, and the advantages of mammography with ten questions selected from several existing scales (Lobell, Bay, Rhoads, & Keske, 1998; Vaeth, 1993; Valdez, Banerjee, Ackerson, & Fernandez, 2002). For example, "Women over 40 years of age should have mammography every year (yes/no/don't know)". An overall knowledge score was calculated based on the number of correct answers to the questions. The response, "don't know", was coded as an incorrect answer. A correct response was scored as 1. The overall knowledge scores are ranged from 0 to 10 points.

Cultural views of cancer and health care. We selected two sub-scales (fatalism and self-care with alpha of .83 and .78, respectively) from a validated Chinese cultural scale to assess cultural views of care in our sample (Liang, Wang, Chen, Feng, Yi, Lee, Schwartz, Pasick, Mandelblatt, in press). The scales were derived from a qualitative study of health views in Chinese women (Liang et al., 2004) and were predictive of their cancer screening outcome (Wang et al., 2006). Participants responded to 12 items, such as "Getting cancer is like being

sentenced to death” (fatalism – 9 items) and “I don’t visit doctors if I’m not feeling sick” (self care – 3 items), in a five-point scale ranging from *strongly agree*, *agree*, *neutral*, *disagree*, and *strongly disagree*.

Health beliefs. The Chinese Mammogram Screening Beliefs Questionnaire was used to measure Chinese women’s health beliefs about breast cancer and screening (Wu & Yu, 2003). Guided by the HBM, this scale is the only questionnaire measuring health beliefs targeted to Chinese-American women aged 40 and older. The 33-item scale includes four subscales: perceived susceptibility, seriousness, benefit, and barriers. The perceived barriers scale was composed of three sub-categories: discomfort, inconvenience, and access barriers (see detailed description in Wu & Yu, 2003). Women responded to the items ranging from *strongly agree*, *agree*, *neutral*, *disagree*, and *strongly disagree*. The Cronbach’s alpha for these subscales ranges from .77 to .90 in other Chinese population (Wu & Yu, 2003) and from .74 to .89 in our sample.

English proficiency. We measured English proficiency in speaking, listening, reading, and writing using part of a well-established scale (Anderson et al., 1993). This scale has reliability of .76 or above. Participants responded to each item with choices ranging from *very well*, *good*, *fair*, *poor*, and *not at all*. We summed up the scores on four items to be an index of participants’ English proficiency. The four-item scale was reliable in our study sample with an alpha value of .97.

Sociodemographic and medical factors. We assessed demographics (i.e. age, education, marital status, income, and length of residency in the U.S.) and medical resources (including presence of health insurance coverage and a regular doctor).

Process evaluation. We used open-ended questions to examine the acceptability of the video among participants. Based on the Center for Disease Control and Prevention (CDCP)

guidelines (AMC Cancer Research Center, 1994), we examined whether the video was clear in presentation, interesting, easily understandable, had a logical sequence, familiar characters, realistic scenarios, and positive images. To measure whether the participants actually watched the video, we queried participants about items included in the video (i.e., the plot in the last scenario and the topics in the physician recommendation) in the follow-up interview. The open-ended questions were coded following the CDCP guidelines.

Data analysis. We examined changes in screening intention, knowledge, health beliefs, and cultural views among 44 Chinese women. Missing values on continuous variables (including culture and health beliefs) at the baseline were imputed by substituting the grand mean. Missing values due to loss in contact and refusal to answer on the follow-up were not imputed. For binary variables (screening intention), we used the McNemar test to examine the significance of intention changes. For continuous variables, we used paired t-tests to examine the significance of pre-post changes. In follow-up analyses we evaluated whether the impact of the intervention on knowledge, cultural views, and health beliefs was modified by key demographic and acculturation variables (see Table 1). To evaluate this, we conducted repeated measure analysis of variance. Although these analyses were exploratory, we retained the level of significance at $p \leq .05$ without adjustment in order to identify potentially important associations that could be evaluated further in subsequent research. All analyses were performed using the Statistical Package for Social Science (SPSS-PC) version 12.0 (SPSS Inc., Chicago, IL).

Results

Table 1 summarizes other demographic characteristics of the study sample.

Process evaluation

Overall, 86% of participants reported that they liked the video. Participants said that the video was clear (100%), comprehensive (98%), interesting and persuasive (84%), and that the plot in the video was realistic (87%). Eighty-nine percent of the women would recommend the video to others. Only 5% ($n = 2$) said that their fear of breast cancer was increased after viewing the video, whereas 43% ($n = 18$) said their fear was decreased and 52% ($n = 22$) remained the same. All respondents were able to recall characters and plot in the video and the content of the physician recommendations.

Outcome evaluation

Screening intentions increased from 37% at baseline to 88% at follow-up ($p < .0001$). Among the 39 women who reported that they intended to get a mammogram after watching the video, 89% ($n = 30$) indicated that their intention was a result of watching the video. Further, 73% of these women reported that the video had influenced their intention “extremely” or “very much”. Significant increases of intention were evident in all subgroups based upon history of mammography, age, educational level, income, presence of insurance and regular doctors, length in the U.S., and English proficiency (see Table 1).

The video also increased participants’ knowledge, Western cultural views, perceived risk about breast cancer, and perceived benefits of mammography (Table 2). Knowledge scores increased from a mean of 7.36 at baseline to 8.43 at follow-up ($p = .001$). There was an improvement on each individual knowledge item except the item “breast cancer increases with family history”. The mean score of this item decreased 1.4 points from the baseline; that is, some women who thought that breast cancer increases with family history at baseline did not believe the statement at the follow-up. This may be a result of the physician’s message in the

video clarifying that about 75% of women having breast cancer do not have any genetic reason or family history.

Women who watched the video also exhibited a significant reduction in their Eastern views of cancer and health care. After viewing the video, they were less likely to endorse the beliefs that cancer is a fatal disease and a result of personal fate, and that they do not need to visit doctors when they are healthy and maintain good lifestyles.

Three of the four sub-variables of the health belief scale exhibited significant changes from baseline to follow-up. Only mean scores on perceived seriousness did not significantly change. In terms of decreasing specific barriers, the video significantly reduced women's concern about the pain and radiation effects from mammography, inconvenience (i.e., too busy to visit doctors), and access barriers.

In the repeated measures analyses, we evaluated the following variables to determine if they modified the impact of the intervention: mammography history, age, education level, income, insurance status, having a regular physician, years in the U.S., and English proficiency. Results from these analyses showed that several variables were associated with pre-post changes in our key outcomes of knowledge, cultural views, and health beliefs. As shown in Table 3, prior screening status was associated with changes in knowledge ($p = .05$) and perceived seriousness of breast cancer ($p = .01$). Specifically, the video led to greater increases in knowledge and perceived seriousness among participants who had never been screened (mean difference (Δ) = 1.66, and 3.72, respectively) compared to participants who had previously been screened ($\Delta = .52$ and $-.32$, respectively). Similarly, income was associated with differential changes in knowledge ($p = .03$), perceived seriousness ($p = .04$), and perceived benefit ($p = .02$). Specifically, women with over \$20,000 annual income had a smaller increase in knowledge and

perceived seriousness scores ($\Delta = .34$ and $-.53$, respectively) compared to women with lower incomes ($\Delta = 1.58$ and 2.93 , respectively), and low-income women had greater increases in perceived benefits ($\Delta = 5.24$) compared to high-income women ($\Delta = 2.79$).

Discussion

Results from this process and outcome evaluation suggest that a culturally tailored video guided by HBM is well accepted by immigrant Chinese women who have never or not recently had a mammogram. After viewing the video, these non-adherent women significantly increased their knowledge and intentions to obtain a mammogram and reduced their cultural and attitudinal barriers to use of mammography. These results support our hypothesis that a theoretically guided and culturally sensitive educational video is useful to increase breast cancer awareness and reduce barriers to breast cancer screening.

Similar to other minority populations (Austin et al., 2002; Slenker & Grant, 1989; Smith et al., 2001), Chinese women perceive low breast cancer risk, less benefits of mammography, and concerns about radiation, pain, and embarrassment. Moreover, Chinese women possess culturally-based fatalistic views and Eastern way of healthcare. Unlike African-American and Hispanic women stressing the role of God in causation and curability of cancer (Austin et al., 2002; Holt, Clark, Kreuter, & Rubio, 2003; Kinney, Emery, Dudley, & Croyle, 2002; Pérez-Stable, Sabogal, Otero-Sabogal, Hiatt, & McPhee, 1992), Chinese women view cancer as predetermined by personal luck or fate (including body constitution); one can do less to reduce risk if meant to get cancer in one's life destiny (Stranghan & Seow, 2000). On the other hand, Chinese believe that diet has a profound effect in cancer, believing that many diseases are caused by what one eats, drinks, and digests in the body (Simpson, 2003). Low-accultured participants even suggested that the video could contain more dietary recommendations for

cancer prevention. They also believe that exercise helps keep the “chi” and blood in good circulation that maintains body vitality (Simpson, 2003). These low-acculturated women favor natural approaches over medical examinations since the former is more fundamental to prevent diseases than the latter, especially when the examination may cause unnecessary harms to the body and when one does not feel sick or have symptoms. Thus, although fatalistic views and self-care are also the correlates of other minority women’s screening behaviors (Austin et al., 2002; Facione, Miaskowski, Dodd, & Paul, 2002; Powe & Finnie, 2003), it seems that there are different connotations underlying these constructs across different ethnic groups. Cross-cultural studies with in-depth investigation of how these health beliefs vary from different cultural groups may benefit our efforts in implementation of effective health education to promote better health outcomes.

The effect of this video seems to be fairly similar across different demographic groups of Chinese women. However, our exploratory analyses suggest that the video intervention may have a greater effect in increasing knowledge and perceived seriousness among women who have never had a mammogram and had low income ($\leq \$20,000$). There is considerable overlap among these groups with 65% of never screened women ($n = 21$) reporting an annual income of less than \$20,000. Overall, these women were also older, had poor English ability, and were less likely to be insured. These constraints may have limited these women’s ability to obtain information about early detection of breast cancer and further understand their risk for breast cancer. This is consistent with our focus-group results and prior research (Facione et al., 2000; Ma, 1999; & Mo, 1992) suggesting that women who are poor and less acculturated are least likely to seek Western medical information and service. As a result, our linguistically and culturally appropriate breast cancer educational video may have been providing new information

to these women. As a result, the video may have alerted these women to the seriousness of breast cancer and of the importance for early detection. These results raise the possibility that the video intervention may be most beneficial to those women who are the most underserved. However, these results should be interpreted cautiously, given the post-hoc nature of these analyses and the low sample size. We plan to further evaluate these variables in future randomized trials that are sufficiently powered to detect such moderators of the intervention effect. Overall, our results suggest that the increase in screening intention rates may be mediated by changes in knowledge, health beliefs, and Eastern views of care. However, this small pilot does not have sufficient power for a full examination of such mediation effects; this is an important focus of our future work.

Our findings support previous research in other populations, showing that health communication via a video tool is effective in educating women about breast cancer and screening mammography (Davis et al., 1998; Drindel, Brown, Caplan, & Blumenthal, 2004; Yancey, Tanjasiri, Klein, & Tunder, 1995). While other culturally sensitive soap-opera videos show moderate effects in improving attitudes and beliefs in other minority women (Drindel et al., 2004; Jibaja et al., 2000; Valdez et al., 2002), our video show strong effects in promoting positive attitudes towards breast care among Chinese women. We attribute the success of this video to the cohesive integration of a theoretical framework and active community involvement. Also, distinct from other video programs (Davis et al., 1998; Jibaja et al., 2000), we included a culturally valued medical authority- - a physician articulating to the viewers why adherence to breast cancer screening guidelines is important. This might have greatly enhanced the effect of our video. Culturally tailored intervention programs are often considered more competent in health communication than non-culturally tailored programs (Springton & Champion, 2004). In

fact, little research has studied the extent to which culturally tailored materials outweigh non-tailored materials. Future research comparing culturally tailored and conventional approaches will be needed.

There are several caveats that should be considered in assessing our results. First, our relatively low participation rate (58%) raises the possibility of participation bias and may limit the generalizability of our results. Thus, the results of our study might not be generalized to other Chinese populations. Additionally, our focus groups and evaluation sample were recruited on a voluntary basis; that is, those who participated might be different from the general target population, such as being more interested in watching a video or having less attitudinal barriers to mammography in the first place. Hence, the preliminary results of this study will need to be confirmed by testing the effect of this video in a broader Chinese population. With a small sample size, we also could not perform multivariate analysis to determine which variables were independently associated with our outcomes. Also, because of time and funding constraints, our evaluation design could not include actual mammography utilization and we were unable to include a control group. Lack of a comparison group limits any conclusions that we can draw about the efficacy of this video. The significant increase in intention to obtain a mammogram after viewing the video may be due, in part, to the effect of social desirability. It is possible that participating women would give their positive responses to encourage our effort in promoting breast cancer awareness and prevention. Finally, we also found that some portions of the physician recommendation confused women about the relationship between family history and breast cancer risk. Further modification of the message (such as stressing that women with family history of breast cancer have higher risk for developing breast cancer than women without) will be needed to correct this confusion.

Despite these limitations, this study has implications for how to promote health communication within Asian populations. First, this video was rigorously created in correspondence to prior research findings, culturally valued elements, and a strong conceptual framework (HBM). Second, we used a community-partnered approach to develop the video. Our preliminary evaluation of this video provides scientific support that this approach is important in the development of a culturally appropriate educational program for Chinese or Asian populations. Third, the results of our outcome evaluation suggest that this culturally-tailored educational video is instrumental in reducing knowledge, attitudinal, and cultural barriers in non-adherent Chinese women and should promote adherence to breast cancer screening. This video is the first theoretically guided and culturally tailored media program to counter barriers to mammography use in Chinese women that we are aware of. Our next step is to conduct a randomized controlled trial to examine the efficacy of this video in promoting adherence to mammography screening guidelines in a broader community population. Our preliminary findings suggest that this video has the potential to reduce disparities in breast cancer screening in this large immigrant minority population.

Implications for practitioners

It might be premature to give clinical implications for practitioners since this study was a preliminary evaluation of the educational video and was based on a small sample of immigrant Chinese women. However, the results of this study suggest that a medical professional's explanation is able to modify Chinese women's misconceptions and negative attitudes toward Western preventive care. Communications between practitioners and patients might be facilitated when practitioners are sensitive to culturally-based views of health care held by immigrant, low-aculturated women. In addition, this video seems to be a useful tool to educate

Chinese patients about breast cancer and screening mammography. Practitioners and health educators might play a culturally-tailored video about health issues in their clinical settings (i.e. waiting room) to enhance their medical communication with Chinese patients.

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Table 1

Changes in Intention to Obtain a Mammogram Before and After Viewing the Video

		Pre- intention	Post- intention	% Change	P-value
All Women	N (%) 43 ^a	Yes (%) 37.2	Yes (%) 88.4	51.2	.000
Mammogram					
Ever, but >2yrs	22 (52%)	31.8	90.9	59.1	.000
Never	21 (48%)	42.9	85.7	42.8	.012
Age^b					
40-59	21 (49%)	33.3	85.7	52.4	.001
60+	22 (51%)	40.9	90.9	50	.003
Education					
College	22 (52%)	18.2	86.4	68.2	.000
≤High School	21 (48%)	57.1	90.5	33.4	.039
Income					
≤20,000	26 (59%)	38.5	88.5	50	.001
>20,000	17 (41%)	35.3	88.2	52.9	.004
Health insurance					
Yes	27 (64%)	40.7	85.2	44.5	.000
No	16 (36%)	31.3	93.8	62.5	.006
Having regular MD					
Yes	18 (42%)	55.6	88.9	33.3	.031
No	25 (58%)	24.0	88.0	64	.000
Years in US					
<10^c	15 (35%)	46.7	100	53.3	
≥10	28 (65%)	32.1	82.1	50	.001
English proficiency					
Low	22 (52%)	45.5	90.9	45.4	.006
High	21 (48%)	28.6	85.7	57.1	.000

Note. ^aOne missing value in the baseline, so the total N was 43. ^bThe mean age of the sample was 58 years ranging from 41 to 75 years old (standard deviation, SD = 10.19). ^cSignificant test was missing since one cell remains constant and would not be computed.

Table 2

Mean Differences in Knowledge, Cultural Views, and Health Belief Variables and Their Subscales Before and After Viewing the Video

Factors	N	Pre-mean score (SD)	Post-mean score (SD)	P values^a
Knowledge	44	7.36 (1.88)	8.43(1.40)	.001
Cultural views	38	38.55(6.56)	45.53(7.73)	.000
Fatalistic	38	30.05(5.68)	34.76(6.70)	.000
Self-care	44	8.61(2.36)	10.75(3.05)	.000
Perceived susceptibility	41	10.25(2.22)	12.24(2.19)	.000
Perceived seriousness	29	26.16(2.17)	27.66(4.12)	.080
Perceived benefits	43	23.72(1.80)	27.93(3.31)	.000
Perceived barriers ^b	34	44.65(8.42)	31.09(8.88)	.000
Access barriers	40	19.62(4.37)	15.28(5.69)	.000
Discomfort	40	15.29(3.56)	10.03(3.84)	.000
Inconvenience	40	10.18(2.43)	6.8 (2.99)	.000

Note. The number of N varied because there were different missing values in each variable in the follow-up data. High mean scores means that women had higher knowledge, more Western views of care (lower fatalistic views and self care), were more susceptible to breast cancer, and felt more seriousness about getting breast cancer, except that higher means scores on perceived barriers indicates more barriers to obtain a mammogram. SD = standard deviation.

^aThe P values were determined by the paired t tests.

^bThe total respondents to the whole perceived barrier scale were 34 women; however, there were four different or same respondents who did not answer some of the questions in each subscale.

Table 3

Mean Differences in Repeated Measures of Knowledge and Perceived Seriousness Scales by Mammography History and Income Status

	Mammogram History							
	Ever screened				Never screened			
	M ₁	SD ₁	M ₂	SD ₂	M ₁	SD ₁	M ₂	SD ₂
Knowledge	7.83	1.44	8.35	1.53	6.86	2.20	8.52	1.23
Perceived seriousness	26.38	1.56	26.06	4.39	25.90	2.79	29.62	2.82
	Income Status							
	High income (>\$20,000)				Low income (≤ \$20,000)			
	M ₁	SD ₁	M ₂	SD ₂	M ₁	SD ₁	M ₂	SD ₂
Knowledge	8.33	1.41	8.67	1.75	6.69	1.89	8.27	1.12
Perceived seriousness	25.95	2.32	25.42	4.14	26.31	2.11	29.24	3.38
Perceived benefit	23.77	2.11	26.56	4.34	23.68	1.60	28.92	1.85

Note. M₁ was denoted as pre-test mean score and M₂ was post-test mean score, same for SD₁ and SD₂ (SD = standard deviation).